SCIENCE

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THE NEW ORLEANS MEETING.

THE meeting of the American Association for the Advancement of Science at New Orleans is a further step towards making the association truly national and representative of the men of science of the whole country. There has been a natural tendency for the association and its affiliated societies to meet near the center of scientific population, and it is of course under these conditions that the largest number of members can be brought together. But our scientific workers are by no means confined to the eastern and central states. When the association in 1901 met for the first time west of the banks of the Mississippi it was a natural acknowledgment of the westward extension of scientific institutions. The meeting at Denver was decided on with some hesitation, but it proved to be one of the most interesting in the history of the association. Not since 1850 has the association met further south than Nashville and St. Louis. But the south is now making marvelous progress in its material resources, and its educational and scientific development will soon be in equal measure. Tulane, Texas and other universities already occupy a foremost position, and their growth as centers of scientific research is certain.

A meeting of the association at New Orleans is a proper acknowledgment of

what has been accomplished in the south and an encouragement for further efforts. It will be attended by a large number of scientific men who live within a radius of 500 miles, and should prove unusually attractive to those living in the eastern, north central and western states. The southern and central passenger associations have granted a return ticket for one fare plus twenty-five cents, and this alone should lead many to enjoy a most pleasant and healthful trip. The association has not hitherto been able to obtain these terms, but the great meetings of the National Educational Association, reaching the tens of thousands, have been in large measure due to such arrangements, leading many to take an agreeable and profitable holiday trip at reasonable expense. Anybody who is tired or has a cold can not do better for himself than to go to New Orleans next week. But there are larger motives for those who are interested in the scientific development of the country and in the solidarity of scientific men to add to the success of the approaching meeting by their attendance. The best train for eastern members appears to be one over the Southern Railway, leaving New York at 4:25, Philadelphia at 6:50 and Washington at 10:45 P.M. After a day's journey over an interesting country, the train reaches New Orleans at 7:15 on the following morning. Those who take this train on Tuesday or Wednesday are sure to find good company, and the railway will supply a special car, should there be enough applications for berths.

The scientific program of the New Orleans meeting is of very considerable interest. The address of the retiring president, Professor W. G. Farlow, is entitled 'The Popular Conception of a Scientific Man at the Present Day.' The retiring vice-presidents will make addresses as follows:

Vice-President Ziwet, before the Section of Mathematics and Astronomy: 'On the relation of mechanics to physics.'

Vice-President Kinnicutt, before the Section of Chemistry: 'The sanitary value of a water analysis.'

Vice-President Smith, before the Section of Geology and Geography: 'On some Post-Eocene and other formations of the Gulf Region of the United States.'

Vice-President Merriam, before the Section of Zoology: Title to be announced later.

Vice-President Magie, before the Section of Physics: 'The partition of energy.'

Vice-President Robinson before the Section of Botany: Title to be announced later.

Vice-President Knapp, before the Section of Social and Economic Science: 'Transportation and Combination.'

Vice-President Jacobus, before the Section of Mechanical Science and Engineering: 'Commercial investigations and tests in connection with college work.'

Vice-President Hough, before the Section of Anthropology: 'Pueblo environment.'

The sectional programs will include many interesting papers. Thus the Section of Physiology and Experimental Medicine has arranged a timely discussion on 'Yellow Fever and other Insect-borne Diseases,' which will be taken part in by a number of leading students of the subject.

When the association meets in one of the large eastern cities, the interest is largely confined to the scientific programs. But New Orleans and the neighboring regions

have many of the attractions of a foreign country, which are entirely unknown to most scientific men of the eastern, central and western states. Further, it is a real privilege for the scientific men and other residents of the city to entertain the association for the first time, and the entertainments and excursions will be more attractive and characteristic than at the ordinary meetings.

The American Chemical Society, The Botanical Society of America and some seven other societies will meet with the association at New Orleans. But many of the national scientific societies will this year meet in widely separated places, as shown in the program printed under 'Societies and Academies.' It is natural that these societies, whose programs depend largely on a compact group of members, could not undertake the wider mission of the American Association. It is also true that there are attractions in smaller meetings in university towns, which can not be sacrificed without regret. It is to be hoped that ultimately convocation week will be left free for a national meeting of scientific men, and that the association will in the summer organize a less formal meeting at one of the smaller university towns or other places where social life may be informal and pleasant. Such a plan is proposed next year for Ithaca. The national societies devoted to special sciences will of course meet when and where their interests will be best served, but it is not likely that it will prove advantageous to meet at the same time as the larger group and in a different place. We may in any case count on an increasing spirit of cooperation among our scientific men and a gradual elimination of difficulties that are inevitable when adjustments must be made to new conditions. Perhaps all that can be expected or is desirable at present is that all scientific men should meet at the same place every second or third year. It was intended to arrange for a common meeting in Boston next year, but owing to the fact that the American Medical Association and the International Zoological Congress will meet in that city, it may be found wise to postpone the Boston meeting. In that case New York City appears to be the most desirable place for a convocation week meeting of the scientific men of the country.

ANTHROPOLOGY AT THE LOUISIANA PURCHASE EXPOSITION.[1]

I.

THE motive of the department was to diffuse and incidentally to increase knowledge of man and his works. Hence, the primary purpose was essentially educational; and the work of the department was distinctive, if not unique, in that it embraced research in a degree comparable with that accorded to original work in modern institutions of higher learning.

Anthropology is the science of man. In the broad sense it deals with all mankind and their attributes. Its aims and purposes are connected with man as an organism, and as the type of the class of living things distinguished by mentality; also it deals with mankind as an assemblage of

[1] Opening chapter of the final report of the chief of the department of anthropology, entitled 'Motive and Scope of the Department'; published with approval of Hon. David R. Francis, president, and Hon. F. J. V. Skiff, director of exhibits of the Louisiana Purchase Exposition.

varieties or races, and as social creatures united by language and law and organized in families, communities, societies, commonwealths and nations. In like manner the science in its broader aspects deals with man as a producer or creator of artificial things, and so as a progressive power in the conquest of lower nature; and in its highest aspect the science deals with the development of both man and his works, and seeks to trace the paths of human progress not only in the interest of definite knowledge concerning our own kind, but in the hope of wiser guidance toward future progress.

Such, in brief, is the broad science of anthropology; and of such were the field and the motives of the department.

II.

Practically, the field of anthropology is divided among several subsciences, each pertaining to a class of human attributes:

1. The science or subscience of man considered as an organism, or as the highest genus and species of the animal realm, is called physical anthropology or andrology; its object-matter is the individual human organism, or anthropos; its methods include anthropometry and the comparison of the characteristics obtained thereby. It embraces anatomy and physiology, and is closely related to the beneficent sciences connected with medical theory and practise.

2. Of late, the science of the human mind and of man as an organism dominated by mental power is called psychology; its object-matter is the psyche, individual and collective; it deals with the brain and nervous system considered in relation to bodily movements and actions, both individual and collective; its methods embrace psychometry and the comparison of the characters of individuals and classes ascertained thereby. Especially in the practical applications which grew up before the science assumed systematic form, it embraces several branches of more or less definite knowledge, and is related to the most important directive and repressive instrumentalities of modern life, including education, alienism and social regulation.

3. The still broader science of the human activities, or of man as a producer or creator, and also of human productions, is commonly known in its descriptive aspect as demography and in its systematic aspect as demology; its object-matter is the demos, or artificial group; it deals with what men do; and it embraces several subsciences each dealing with an important class of activities, viz., arts, industries, languages, laws and philosophies.

4. The science of man considered as an assemblage of races is known as ethnology; its object-matter is the ethnos, or natural group, of mankind defined in terms of physical, of mental, or of activital features or of these combined; and its methods combine those of the fundamental sciences (andrology, psychology and demology). In its descriptive aspect this is known as ethnography.

5. The several sciences dealing with man and his works touch that development or phylogeny of mankind in which lie the chief interest and value of anthropology; for whatever the immediate aims, it is the ultimate aim of the science to trace the course of human progress and classify individuals and peoples in terms of that progress, and thus to learn so much as may be of the origin and destiny of man. Up to the present, the field of systematic knowledge dealing with the progress of mankind (the science of human phylogeny, sometimes called anthropogeny) has not been clearly defined; for ever since Darwin and Huxley and Haeckel discussed the evolution of man, a third of a century ago, this has been the frontier of anthropology, the

campus of the leading pioneers, the virgin soil of teeming yield whence the richest fruits of each passing decade are gathered. Naturally, in view of the vigorous vitality symbolized by the Universal Exposition of 1904, the virile subject of human progress formed the leading motive of the department of anthropology—the exposition, indeed, affording the world's finest opportunity for framing the science and setting is on a firm basis. The objects-matter embrace the generations, families, stocks and races of men, with the human activities and products in their endless variety; the methods comprise observations and comparisons of growth, heredity, viability, fecundity, and development by exercise and cultivation, together with manufacture and other forms of production. Its leading divisions are: (1) archeology, or the science of human relics, with the human paleontology covering fossil and other remains of prehistoric man, and the paleography dealing especially with ancient writings; (2) history; and (3) the unclassified and nameless body of knowledge concerning current conditions and events in the human world.

Such, in general terms, are the main divisions of anthropology, outlined with special reference to the work of the department.

III.

It is a leading aim of anthropology to classify the peoples of the world in convenient and useful ways; and different classific systems have been devised.

The prevailing classification of mankind during the eighteenth and nineteenth centuries was ethnic, *i. e.*, the peoples of the world were divided into natural groups, defined chiefly by physical characteristics, called races. Partly by reason of limited information concerning the remoter peoples, ethnologists differed somewhat as to the definition and number of the races of mankind; some held that the world's peoples were better divided into twenty or thirty or even into fifty or more races, while others found it more convenient to reduce the number. During the later half of the nineteenth century there was a strong tendency to reduce the races or principal varieties of mankind to five, viz.: (1) the Caucasian or white race, especially characteristic of the central and western portions of the Eurasian continent; (2) the Mongolian or yellow race, inhabiting the eastern-central portion of the same continent; (3) the Malayan or brown race, occupying the southeastern border and islands; (4) the African or black race, inhabiting the continent of Africa; and (5) the Amerind or red race, inhabiting the two continents of America. This classification is simple and convenient, but open to the objection that certain peoples hardly fit any one of the five classes; the Japanese are neither white nor yellow nor brown, much less red or black, forming, indeed, an ethnologic puzzle, if not a distinct race; while the Blackfellows of Australia and the Papuans of New Guinea, the tribes of eastern Madagascar, various islanders of Polynesia, the Ainu of northern Japan, certain peoples of southern Eurasia with the Laps and Tartars of the north, the Eskimo of the western hemisphere, and several other peoples depart in greater or less measure from the five race-types.

From the earliest times, thinking men classed mankind in two or more divisions, of which the lower was regarded as ranking with brutes; and this view survives to-day among most primitive peoples. So the ancients divided the human genus into two species, *Homo sapiens* and *Homo brutus*, and held the former to possess and the latter to lack mind and soul. As exploration proceeded and knowledge of remoter peoples progressed during recent

centuries, scientific observers were more impressed by the resemblances among than by the differences between the human types, and were unable to discover or define the brutal species recognized by the ancients. Yet the question of affinity or relationship between man and lower organisms—and no greater question has arisen in all human history—refused to down, and reappeared in inquiries concerning the origin of man. In England Huxley and Darwin, and in Germany Haeckel, showed that the structure of the lowest humans more nearly resembles that of the highest quadrumanes (the 'four-handed' ape-like animals) than that of the highest humans, and from all known facts of both structure and development drew the inference that just as lower humans grow into higher types, so, in earlier times, some of the higher quadrumanes grew into lower humans; and much was said of the prospective finding of a 'missing link' combining more nearly than any known organisms the characters of human and quadrumane beings—a prophecy verified a quarter-century later by the discovery of *Pithecanthropus erectus* (erect monkey-man) in Java. The effect of the discussions and discoveries was to keep alive the idea of the close connection between man and the lower animals. Even before the discovery in Java, renowned anthropologists in Europe, and especially in Germany, noted a correspondence between the white, yellow, brown and black races of the old world and four leading types of quadrumanes, and suggested that the four human stocks were fundamentally distinct and had descended (or ascended) from the subhuman species. From this suggestion sprang the doctrine of polygenesis, which was opposed by those who preferred the theory of monogenesis, *i. e.*, the descent of all mankind from a single pair—the theory fostered by tradition and the doctrine of evolution, and originally held by all peoples. One effect of the ensuing discussion was to fix more clearly in all minds the classification of the peoples of the old world in four ethnic divisions or races; another was to keep in mind the idea of our ancestors that at least some men and the lower animals are closely akin. At every stage the views of the experts found their way into general thought, too often with some distortion; and partly for this reason all the world desires to see the lowest and remotest types of mankind, preferably in connection with those higher quadrumanes whose man-like features and movements form a source of endless interest to old and young alike.

In the early discussion of types of mankind and of human prototypes, little account was taken of the western hemisphere and the red race; when not altogether neglected, the aborigines of the American continents were commonly dismissed as emigrant offspring of an old-world stock admitted to the new world during prehistoric times over Behring Strait or some other transoceanic way. Especially during the later half of the nineteenth century the native tribes of the western hemisphere were brought under systematic observation, as were various other little-known peoples; and the observers were impressed by the number of aberrant or outstanding types—peoples like the Japanese, the Papuans and others who fail to conform to the conventional varieties or subspecies of *Homo sapiens*. The new world natives were easily defined as an additional variety or race, at first miscalled Indian in perpetuation of Columbus's error, then known generally as American, and afterward designated specifically as the Amerind type or race; yet even this race was found to present a considerable variety of physical types or subspecies, such as the Eskimo of the north, the so-called 'giants' of Patagonia, the light-skinned and almost flaxen-haired deni-

zens of certain mountain districts, and other peoples departing from the copper-tinted, black-maned and medium-size standards. In seeking to classify the local tribes, ethnologists were led to note industrial and social (*i. e.*, activital) features in addition to physical characters; and so began a system of classifying peoples on the basis of conduct, or in terms of what they *do* as human creatures rather than what they merely *are* as animal beings. In Europe there was a tendency to classify both living peoples and the relics of their precursors in terms of industrial development, and the stone age, the bronze age and the iron age were defined; in America the native tribes were classified first by the statesman-scientist Gallatin, and more fully by the scientist-statesman Powell, in terms of language; while some authorities classified so many as might be of the world's peoples according to their respective modes of social organization. An outcome of these essays was a system in which known peoples are combined in groups defined by distinctively human attributes; defined on the industrial basis, the groups were some time denoted (1) Paleolithic, (2) Neolithic, (3) Bronze and (4) Iron, and afterward and more broadly (1) Protolithic, (2) Technolithic, (3) Metallurgic and (4) Mechanical; and defined on the basis of social organization the peoples were grouped as (1) Maternal (or Avuncular), (2) Patriarchal, (3) Civic and (4) Democratic—the classes or groups in either case representing types of culture. A more important outcome was clearer recognition of the classific distinctness of man, coupled with living realization that, whatsoever his genetic affinities, man as an active and creative being rises far superior to any quadrumane or other animal prototype—for even the lowest human is an upright, two-handed and two-footed hairless body with his face to his fellows, while even the highest quadrumane (or quadruped) is but a groveling and bristly beast with his gaze and half-hands on the ground.

As the world's peoples and tribes were classed by race and culture jointly, it was soon seen that the types of culture really represent grades or stages in development, and also that the exercise of function and organ attending culture is a material factor in development; and hence that the course of human progress is not that of vital evolution alone, but one affected increasingly through the ages by activital forces arising in and with man himself. Like other beings of the animal realm, man is indeed a creature of birth and heredity and is influenced by environment; but through his collective activities, themselves the product and measure of culture, it becomes his chief function to modify environment and make conquest over lower nature. Even the primal factor of heredity passes partly (and increasingly) under social control; while the races occasionally blend, sometimes with so ill effect that the mixed family fades, yet often with so good result that to-day the world's peoples may be graded by ethnic complexity, the world's strongest blood being the world's most-mixed blood—and this blending reveals a law of convergent development (or intensification) extending the doctrine of polygenesis far beyond the four old-world types and suggesting that any or all of the more isolated tribes may represent primary stocks developed independently from fit local prototypes. So in the human realm the activities are paramount; and mankind may be classified either independently of or in conjunction with racial affinities in accordance with the activities and with the culture-stages defined in terms of the activities. Classified in this way, the peoples of the world fall into one or another of the four principal stages according to the degree of their advancement in some or all

of the activities; and it is the special merit of this classification that it is based on and in turn becomes an index to what the peoples habitually do, and hence to their aptitude and capacity for uniting with other peoples to promote human interests and the welfare of the world. Reduced to a scheme somewhat more consistent and arbitrary than might be found in any single continent, the activities and the principal stages of their development are as follows:

Activities.	*First Stage.*	*Second Stage.*	*Third Stage.*	*Fourth Stage.*
Arts,	Mimetic,	Symbolic,	Conventionalistic,	Idealistic.
Industries,	Imitative,	Divinative,	Constructive,	Inventive.
Laws,	Maternal,	Patriarchal,	Royal,	Social.
Languages,	Demonstrative,	Descriptive,	Associative,	Reflective.
Philosophies,	Zooic,	Theurgic,	Metaphysic,	Scientific.

When the world's peoples are classified by culture-grade, or in terms of progress from the lowest to the highest stages, it at once becomes manifest that they are arranged in accordance with mentality, knowledge and cerebral capacity, and measurably (with a few apparent exceptions) in accordance with general physical development, including strength, endurance and viability. It is especially significant that the distinctively human attributes of mentality and knowledge characteristic of each culture-grade are essentially alike among all the peoples pertaining to that grade, however remote their homes and however diverse their physical characters; for these correspondences reveal a comprehensive law now recognized as forming one of the five cardinal principles of science: the first of these is the indestructibility of matter, established by Lavoisier; the second is the persistence of force, discovered by Rumford and Joule; the third is the uniformity of nature, demonstrated by Tyndall and Spencer; the fourth is the development of species, brought to light by Darwin, Wallace and Huxley; the fifth is the responsivity of mind, suggested by Bacon and established by current researches in anthropology. The fundamental quality of these laws is such that the phenomena of nature (including those of the human realm) can not be interpreted without recognizing or at least postulating all of them; and that no other postulates are required for the interpretation of phenomena. The last-named law summarizes observation in such wise as to show that all mankind are closely bound in a potential if not actual community of thought, sentiment, aspiration and interest; and that, although the germ of mentality springs among the lower organisms, the psychic chasm separating man from the beasts is far wider than the physical break. Now when the world's tribes and peoples are classified by mind and knowledge, they fall into groups each characterized by those activital relations and motives peculiar to particular stages in the conjoint development of mental and manual processes; so that the final classification is a systematic arrangement of man and his works, both viewed in the broadest aspect and reduced to terms of works. Somewhat provisionally expressed in a conspectus, which like any other tabular arrangement is simpler and more arbitrary than the apparent chaos of unreduced facts might seem to demand, the better-studied classes (industries and industrial products, laws and institutions, and philosophies) may be represented as on p. 817.

Such are the leading classifications of mankind, by race, by genetic affinity, by activity, by stages of activital development, and by those steps in mental progress which during the ages have raised man from the

plane of the animal to his distinct and exalted position as a progressive conqueror of lower nature; and of such are man and the works of his hand and mind.

	Stage.	Nature.	Relation.	Motive.	Type-product.	
Industries.	I.	Protolithic,	Imitative,	Zoomimic,	Organ-adjunct,	Age of stone.
	II.	Technolithic,	Divinative,	Fatalistic,	Implement,	
	III.	Metallurgic,	Constructive,	Dynamic,	Tool,	Age of metal.
	IV.	Panurgic,	Inventive,	Kinetic,	Device,	
Laws.	I.	Maternal,	Adelphiarchal,	Zoocratic,	Clan,	Tribal society.
	II.	Paternal,	Patriarchal,	Theocratic,	Gens,	
	III.	Hereditary,	Oligarchal,	Aristocratic,	Kingdom,	National society.
	IV.	Electional,	Representative,	Democratic,	Republic,	
Philosophies.	I.	Zootheistic,	Instinctive,	Zoic,	Animism,	Age of myth.
	II.	Mythologic,	Subjective,	Theurgic,	Mysticism,	
	III.	Metaphysic,	Deductive,	Taxic,	Scholasticism,	Age of reason.
	IV.	Scientific,	Originative,	Telic,	Research,	

IV.

In the general view (in which the outlines are strengthened by classification), mankind are separated from all lower animals by certain small differences in size, form and structure, and by several large distinctions in habits of life; so that while the anatomist finds connecting links between simians and men, and while physiologists find their functions much alike, the student of broad anthropology defines man as the fire-making animal, and hence a user of cooked food and in other ways a creator of his own chief distinctions from the brutes—for all men known of themselves or from relics enslaved fire, while no lower animal masters this most potent of forces for the conquest of nature. So man stands out as a unique and dominant organism in the animal realm; and at the same time as a type or order of creative beings bound together by the power of control over natural forces for the common welfare.

The fire-maker, man, is distributed over all lands in a number of races and a still larger number of industrial and social varieties. Until recently all of both Americas was occupied by the Amerind race, and the red men were confined to these continents with their neighboring islands and a small section of adjacent Asia; nearly all of Africa was occupied by the African race, while the black men extended beyond this continent and a few neighboring islands only in a modified or negroid type; and the great Eurasian land-mass with its peninsulas and islands was the home of three races—the white men who lead and the yellow men and brown men who follow in that conquest of lower nature through the control of natural forces begun by the making of fire. The physical variations were least in America, more in Africa, most in Eurasia, where the physical break between highest and lowest (albeit spanned by numberless links) is greater than the chasm between the lowest human and the simian.

Until within a few centuries, most of the fire-making folk remained isolated, partly because of intervening seas, chiefly because of intervening gulfs of faith and custom; though some tribes were united in confederacies in which the chief bond was similarity in belief, the next similarity in speech, and the next similarity in work and industrial standards. In North America there were at the time of exploration some 1,200 or more tribes speaking some 75

totally distinct languages, each in several dialects; some of these were united in confederacies, like the Iroquois or Six Nations, and the Dakota or Seven Councilfires, and others lived in an inchoate feudal system, like the Montezuma group of Mexico; some tribes traced kinship in the female line and gave little thought to paternity, while about an equal number (including many of the wanderers and the most advanced sedentary folk) rested their social laws on paternal kinship; while the food-sources, implements, customs and habitations varied first with local peculiarities of habitat and in less degree with ancestral customs and migrations —the range running from corn-growing dwellers in stone, adobe and palm-wattled houses in the southwest, to hunting and fishing folk living in birch-bark wigwams in the east and thence to walrus-hunting occupants of snow-houses in the north and back to the buffalo hunters of the plains lodging in skin tipis in summer and earth-houses in winter, and thence to the salmon fishermen in single-log boats and hewn-slab houses (both consecrate unto carved and painted totems) in the northwest. In South America the fiducial and linguistic, social and industrial varieties were fully half as many; and the range from the stalwart Patagonians of the south to the puny woodsmen of the upper Orinoco, or from the knifeless Guayaqui savages to the aqueduct-building Inca kings, was even wider than that of North America. In Africa there were hundreds of tribes, speaking scores of distinct languages, of which some suggest the inconsequent chatter of Kipling's Bandarlog and really express some community of interest and feeling between lowly men and lower monkeys; and the tribes belong to two leading physical types, the shy and secretive aboriginal people of pygmy stature, and their full-size conquerors—sometimes stalwart and strong-limbed and of heroic stature, who long ago overspread the dark continent, bartering in iron and ivory and gold and often in slaves, and still live in a curious condition of mutual toleration and interdependence with the half-tamed little people. In Australia there were at least scores of negroid tribes, or Blackfellows, speaking a dozen or more distinct and notably primitive tongues, in which, as among some of the African pygmies, bird-like clicks and beast-like gutturals and monkey-like chatterings served in lieu of well-defined words, if not of entire parts of speech; though timid and generally peaceful, the tribes were often at bloody war, and though varying in physical form and feature, they were much alike in that few could count above five, none above seven or nine, and many stopped at three, in that their marriage laws were the most elaborate known, and in that many of the tribes merged sex-differences by ceremonial and surgical devices. On the miniature continent of New Zealand dwelt a composite people whose physical types were largely welded through similarity in esthetic and industrial and philosophic traits and customs, including the world's most elaborate system of heraldic genealogy in the form of facial tattooing; and in Oceanica most of the hundreds of islands and insular groups were inhabited by distinct tribes of two or three dominant physical types, each tribe commonly speaking its own language and pursuing its own special vocations with its own peculiar devices. In Asia there were the world's largest populations in three races, each including divers physical types; even the most homogeneous—the Mongolian—comprised a dozen or more divisions whose differences in speech and customs are not yet fully realized, partly because most of them are dominated alike by a vigorous Manchu dynasty and the terrifying Yellow Dragon; while the northern steppes were ranged by a dozen tribes of varying physique and speech and faith,

and the southern plains and foothills and jungles gave homes to literal hundreds of peoples, distinguished by physical type, by speech and faith, by caste, and by distinctive customs or clear territorial limits—and out of this hive of humanity sprang all the great religions the world has known. In the western fraction of the Eurasian land-mass there were, a half-century ago, several scores of tribes varying in physical type from the blond Dane and rufous Viking to the swart Iberian, speaking some dozens of distinctive tongues, adoring the shrines of countless nature-deities, and garnering germs of drama and letters and philosophy in the Walhalla of the north, the Elysium of the south, and the legion lost fanes and faiths of the middle lands. As the centuries sped, the tribes and tongues were partly blent through conquest by Aryan leaders who carried the cult and the color of the Caucasus northwestward, until by the middle of our era the shore-lands of the North Sea region throbbed with the most commingled blood and the most complex culture of the globe—then the human blood spanned the straits and rose pent in Britain to flow out in streams of compelling vigor, bridging all seas and reaching the remotest lands of the earth. All these—of the Americas and Africa, Australia and Oceanica, Asia and Europe—are among the peoples whose multifarious resemblances and differences appeal to every observer. They are alike in that all are fire-makers and so control thermic force for the weal of their kind through conquest over other nature; and with this suggestion of force as the primary factor in human affairs, the apparent chaos of humanity falls into order—for all are controlled by a few types of law, *i. e.*, of human force directed to human ends. The simplest type of law is that of control of the maternal family, under which the mother protects and directs her own children, appealing when needful to her own mother's strongest offspring, *i. e.*, her eldest brother; and this was the law of the less-developed aborigines of the Americas, Africa, Australia, Oceanica and Asia. More comprehensive is the law of control of the paternal family group, in which the physically stronger father guards and guides his own children and their offspring and dependents and those of his younger (*i. e.*, weaker) brethren; this law befits militancy and nomadic habit and the pastoral condition, and prevailed among the more advanced aborigines of America and Africa and many of the peoples of Oceanica and Asia. Still more comprehensive is the law of control of tenure; in arid lands, where the chief values inhere in springs and wells with adjacent lands, the control is essentially territorial, and in the east Mediterranean region the law gave demos and urbs—*i. e.*, the artificial group and the ancient city; in fruitful lands, where the chief values inhere in occupations and products and good-will, the law is essentially industrial, and in India yielded caste, and elsewhere trades and guilds, *i. e.*, overlapping artificial groups; and in broken country (including archipelagoes) the control is partly territorial and partly industrial, and in eastern Asia, most of Europe, and much of Oceanica, the law produced the province—*i. e.*, the more or less independent region of interdependent interests: and everywhere the basis of the law was economic and proprietary, and its observance reacted on the mind in such manner as to awaken recognition—especially in Greece and Rome and Kong (China) and more especially in Palestine—of the correlative interests of neighbors. While the law of control of tenure rose above the law of control of kindred in principle, the two ran together in practise so that the demos and urbs,

caste, the province, and the nation into which the urbs and province grew, were long controlled by family lines. Most comprehensive in applicability though simplest in ethical essence of all the fundamental types of law is that of control of the individual for the common good; in spirit this law rises above consanguinal and proprietary bonds and gives origin to government of the people, by the people, for the people. Thus, just as man, the fire-maker, rises above lower nature through control of external force, so does man, the law-maker, rise in successive groups above the lower of his own kind through control of the movements and motives reflecting his own internal force; and viewed in the light of law, the apparent chaos of uncounted thousands of the world's tribes and peoples, speaking unreckoned hundreds of tongues and pursuing innumerable vocations, is readily reduced to order.

Viewed as a law-maker, man reveals the stages of his own progress from a primal state to the condition of highest enlightenment—from the low level of the Australian Blackfellows or the African pygmies to the elevated plane of constitutional government. The law of the maternal family befits only a sparse population living largely in a state of nature, *i. e.*, small and isolated tribes of too low intelligence to recognize paternity or organize confederacies, to devise economic systems or to realize humanitarian motives and institutions; in this stage scores of living tribes still rest, while others (like the Muskwaki and Cocopa tribes, some of the Pueblo folk, and a number of Polynesian peoples) are just emerging from it; and its conditions are those under which all early men must have lived. The law of the paternal family is adapted to a denser population of industrial habits, *i. e.*, to large tribes entering on pastoral or agricultural life, and of intelligence sufficient to recognize paternity and to confederate with neighboring tribes for defense and offense, but not to frame economic systems or humanitarian institutions; the clearest early picture of this stage is that afforded by the children of Israel, and its best living illustrations are found among the aborigines of America; and the transition to the next higher stage is recounted in the earliest writings of many peoples and in the interpretations of these by modern genius—such as Fustel de Coulanges's 'Ancient City,' and Matthew Arnold's 'Light of Asia' and 'Light of the World.' The law of tenure is adjusted to still denser populations of commingled lineage, living in large and growing communities, *i. e.*, to industrial peoples gathering into cities and spreading over countries under the influence of intelligence sufficient to frame economic systems coupled with cults tending to foster humanitarian impulses and institutions; the development of this stage makes up most of the world's written history; and the movement toward the next is marked by nearly every popular revolt and by most cabinet revolutions of modern times. The law of the individual (or of constitutional citizenship) is framed for large and progressive industrial populations, *i. e.*, interdependent peoples of intelligence sufficient to recognize lineage and organize alliances, to create economic systems and frame humanitarian institutions, and to live and move in accordance with those principles of benevolence and tolerance and justice underlying all law. It is especially noteworthy (because too commonly overlooked) that in each stage the law is more formal and rigorous and better known in its letter than in the next higher stage, *i. e.*, that with each step in progress the control passes more and more from external domination toward internal force—the inner sense of right among men and

over nature. The way is long from benighted Blackfellow or savage Seri to the apostle of a kindly cult, the founder of a parliament, or the framer of a constitution; yet the world's laws are its mile stones.

Throughout its growth law is the expression of the best judgment and the highest intelligence of the time; hence it affords a measure of mental capacity, or of mind, in each stage of man's progress from savagery toward enlightenment. In each stage, too, the law is connected with arts and industries and with language and philosophy, expressing corresponding degrees of intelligence and affording other yet cognate measures of the mind of the time; and since the arts and industries, the languages and philosophies, are, like the law, the product of progressively expanding intelligence, it becomes clear that mind is the mainspring of man's progress, the special force underlying human development. In this view, the world's peoples are united in a solidarity of growing interdependence in which the less advanced may profit by association with the more advanced, and all may—indeed, must—proceed toward higher and higher intellectual advance, and toward more and more complete conquest over lower nature. In this view, too, the world's tribes and peoples illustrate steps in the development of intelligent man; and each is at once an object-lesson in the ill-written history of the human past and an object for beneficent example and effort—for man has no higher duty than that of mending the way of human progress. In this, as in every other view, the way is long from savage shaman to an Alexander or a Cæsar, from barbaric bandit to a Cromwell or a Washington, from rapacious elder-woman of a maternal clan to a Jeanne d'Arc or a Florence Nightingale—the way is long from a pygmy or an Ainu to a Roosevelt or a Francis: yet the way is so clear that even those who run may read aright if only the steps are shown in living examples.

V.

As the scope of the department was finally defined, it was necessarily adjusted to economic conditions arising from the curtailment, amounting to nearly 98 per cent., in the estimated needs.[2] It was affected also by the unprecedented breadth of scope of the Universal Exposition of 1904; for before the department was finally vitalized the voluntary participation of all the world's races and most of the nations was assured. The field of the department was materially affected, too, by the plans for the Philippine exposition, developed after the original estimates were submitted and before the department was finally created. Under the conditions, the scope of the department of anthropology came to comprise: (1) a representation of a limited number of the world's least-known ethnic types, *i. e.*, races or subraces defined on the physical basis; (2) a representation of a few of the world's least-known culture types, *i. e.*, of peoples defined on the activital (or mental) basis; (3) a representation of the principal methods and appliances used in research concerning the physical and mental characters of mankind; (4) a representation of typical evi-

[2] The estimate of Chairman Lehmann for maintaining the department of anthropology was $3,000,000; the appropriation was $60,000, or two per cent. of the estimate. The estimate of Chairman Chouteau for creating a department of history was $250,000; the appropriation was $15,000, or six per cent. of the estimate, the projected department being merged in the department of anthropology, where it was made one of six coordinate sections. The exposition appropriations were augmented by governmental appropriations for an Indian school and cognate exhibits amounting to $65,000. The final aggregate was thus $140,000, or 4.34 per cent. of the original estimates of $3,250,000 for anthropology and history.

dences of the steps and general course of human progress, including prehistoric vestiges, protohistoric relics and historical records; and (5) a representation of actual human development from savagery and barbarism toward enlightenment as accelerated by association and training.

1. The physical types first chosen for representation were those least removed from the subhuman or quadrumane form, beginning with the pygmy aborigines of Africa; in stature and proportions, in color and cranium, in form of face and function of limb, the little people of the African jungles are commonly considered to approach subhuman types more closely than any other variety of the genus *Homo*. Much like these are the negrito folk of interior Mindanao and other districts, brought to the fair for the Philippine exposition. The next physical type chosen was the Ainu of Hokkaido (or Yezo), the northern island of the Japanese Archipelago. The aborigines of Japan, the Ainu are of uncertain ethnic affinities (though found to comprise two subtypes divided on sex lines); while fairly developed in many respects, their small stature, their centripetal (or bodyward) movements, their use of the feet as manual adjuncts, their elongated arms and incurved hands, and their facility in climbing, approximate them to the quadrumanes and betoken a tree-climbing ancestry. Another type chosen early was the prognathous and long-armed and hence strikingly ape-like Australian Blackfellow; unhappily, one of the failures in negotiation resulting from the narrow monetary margin of the department intervened, and the exposition lost this most distinctive type of mankind not represented on the grounds—though the loss was mitigated in some measure by the ample representation from the same quarter of the globe in the Philippine exposition. Partly as a contrasting physical type, but chiefly to illustrate a variety of the Amerind race reputed since the time of Magellan to be gigantic and known as the largest type of primitive man, a Patagonian group (of the Tehuelche tribe) was selected; their stature probably exceeds the average of that of the most advanced peoples, and their bodily proportions and physical strength are almost equally heroic. Negotiations were completed also for exhibiting another native American group (the Seri Indians of Tiburon Island, Mexico), of nearly equal stature and superior strength and swiftness, though of less weighty frame, the supposed type of Swift's Brobdignagians, and the most savage tribe of North America; unfortunately, the difficulties and dangers of the expedition prevented the carrying out of the contract. Another Amerind group was selected chiefly to illustrate the consistent maintenance of two physical types in a single primitive folk—the Cocopa Indians, inhabiting the country about the mouth of the Rio Colorado in Mexico; in this tribe the men rank among the tallest and the women among the shortest of the North American natives. Other illustrations of the varying physical types among North American natives were exhibited in the Pawnee group (including Roaming Chief, probably the largest man on the grounds); the Dakota, or Sioux, group, representing the powerful and agile type of the northern plains; Pueblo folk, among the smallest of North American natives; dark-colored desert peoples (Pima and Maricopa), notable for agility and endurance, allied to the conquering Nahuatlan—or Aztec—tribe of Mexico; the short-hand and squat and flat-face natives of California (Pomo); and the singularly light-colored fisherfolk (Kwakiutl and Klaokwaht tribes) of humid Vancouver Island. None of the short and

well-rounded Eskimo type (of form befitting a frigid home and reflecting frequent frosting) were represented in the department by reason of the risk of life of Arctic folk attending the average St. Louis summer; though a concession concern on the grounds assumed the risk, to the interest and benefit of many thousands of visitors. Various other physical types were represented in connection with national pavilions or exhibits, or with concessions on the 'Pike'; and in the exhibit palaces and elsewhere within the exposition walls there were numerous typical representatives of the principal varieties of the Caucasian, Mongolian and Malayan races gathered from all the leading countries of Eurasia as well as from modern America, Africa, Australia and the larger islands of the Pacific region—and in addition to these, a constant stream of visitors from every quarter of the globe. On the whole, the gathering of ethnic types of the genus *Homo* was fairly representative, and might have been considered fully so save for the absence of the Australian aborigines, the natives of certain Pacific islands, and a few Asiatic tribes; even with these defects, the assemblage of physical types of mankind was unquestionably much more nearly complete than was ever before brought together.

2. The activital or culture types first considered comprised the lowest and least known; and the groups finally selected served to represent cultural and physical types combined. The failure of the Seri expedition and the negotiations for Australian Blackfellows was particularly regretted, since the former and some of the latter lack knife-sense and only use fire ceremonially, thus representing the lowest known culture; and to make up so far as might be this defect in the exhibits of the department, a protohistoric collection of relics and models (called the synthetic series), designed to illustrate the conquest of fire, the genesis of the knife and the development of the wheel, was brought together and installed in the anthropology building. The Seri savages of Tiburon and the Blackfellows of the Australian bush also exemplify the lowest known types of law and faith; the former are organized in maternal clans in which the clanmother (or elderwoman) is viewed as the vicar of an animal tutelary or beast-god, while her eldest brother is the executive or war-chief of the clan, and the purity of the tribal blood is maintained by most rigorous regulations concerning marriage; the latter have one of the most primitive yet complex social and fiducial organizations known, in which marriage is an elaborate arrangement, men are made to symbolize women by a severe surgery, and the control of movements and affairs is imputed to animal tutelaries. The African pygmies were selected in part to represent the maternal family (or clan) in which the intratribal control resides in an avuncular council, *i. e.*, the elder brothers of the clanmothers; though tribal law is partly overplaced by the control of full-size tribesmen, much as the industrial arts of the little people are affected by contact and barter with iron-making peoples ever since the iron age dawned probably in northern Africa some thousands of years ago. The Ainu were selected to illustrate industries connected with bodyward movements, a primitive agriculture which has produced a distinctive form of millet, specialized architecture befitting a trying climate, a most primitive musical system, and a bear-cult—and in the hope of acquainting the world for the first time with the full law and faith of a little-known primitive folk; while the Patagonians were selected to illustrate the character and use of one of the most effective

known primitive devices (the bolas) as well as the maternal or clan organization, and also to reveal their own religious feeling and philosophy. The Cocopa Indians were selected to represent on the grounds a native American agriculture pursued unbrokenly since pre-Columbian times and still producing corn and other crops native to the western hemisphere, thereby illustrating such native lore and legend as those embalmed in Hiawatha; they also represent one of the most extravagant known mortuary customs, in which the goods of the decedent are distributed to non-relatives, while his house and his body are burned together, so that the people are perpetually impoverished and prevented from gathering in communities; and their marriage and puberty rites are elaborate, while the tribal law is in a state of transition from that of the maternal family to that of the paternal family. The Klaokwaht and Kwakiutl Indians were selected not merely as physical types but to illustrate a native type of house designed to fix the social organization and facilitate the maintenance of law, partly by virtue of elaborate totems (or animal tutelaries); this representation of northern Pacific coast culture-types being supplemented through cooperation with the Alaskan Commission. Several Amerind groups were selected partly to exhibit the leading native arts and crafts (such as pottery-making, basket-working, blanket-weaving and skin-dressing), partly to illustrate the organization of the paternal family (or gens); the Pawnee, Wichita, Navaho, Pima and Kickapoo groups constructed and occupied houses, each of a distinctive tribal type; while the Sioux tipis and other structures and fabrics exhibited sacred insignia betokening barbaric philosophies, of which some were displayed also in musical or dramatic terpsichorean ceremonies. The culture types at the fair, like the physical types, were greatly extended by the Philippine exposition, itself one of the most impressive exhibits of alien life and customs ever assembled; also in various state and national exhibits (among which the East India Pavilion and the Ceylon Tea House deserve note), and by several Pike concessions; while there were numerous collections of alien culture products, such as the Fred Harvey and Benham exhibits in the anthropology building, much of the collection forming the Queen's Jubilee Tributes, special exhibits in the Japanese, Chinese, Siamese, Belgian, Argentine and other pavilions, the Benguiat Museum, *et al.* Finally, the typical products of the most advanced art and industry filled the exhibit palaces with a richer and more cosmopolitan illustration of man's creative activity than the world ever saw before, while the attendant laws and languages and philosophies were set forth in other departments (especially education and social economy) and with unprecedented fullness in that series of legal and educational and scientific congresses through which the Universal Exposition of 1904 made its most impressive display of the power of man and the force of mind.

3. The methods and appliances used in anthropometry and psychometry (*i. e.*, in measuring the physical and mental characters of men) were selected with the purpose of utilizing the opportunities presented by the fair for observing and comparing the human types assembled on the grounds; while most of the apparatus and materials were obtained, and the installation and operation of the laboratories were made feasible, through the cooperation of educational institutions and manufacturers. It was in this branch of the department that the original or investigative work of the exposition culminated, and the conduct of the work was a constant source of

interest and attraction to visitors, while its results form a substantial contribution to knowledge.

4. The general view of human development opens a vista extending so far into the past and so widely into the field of man's activity that the recorded history of any particular province or people seems small in comparison; yet the history of a province or a people forms an effective introduction to the full history of mankind: accordingly, the written history of the Louisiana Purchase gave a keynote for the department as well as a motive for the exposition, and the exhibits were chosen and arranged in consonance with this view. Here, too, the work was made feasible by the cooperation of liberal institutions and individuals, chiefly historical societies and working historians. The nucleus was the collection of the Missouri Historical Society, illustrating by manuscripts and books, relics and portraits, maps and sketches, every important step in the development of the metropolis of the Louisiana Purchase Territory and in the growth of the commonwealth with which it has come up; and also illustrating by aboriginal relics the protohistoric development of the district from the times of aboriginal settlement, the building of earthen tumuli and temples, the growth of a primitive agriculture, and the advent of the bison and its hunters, into the period and through the centuries of discovery and acquisition and industrial conquest by white men. A supplementary illustration of development and conquest from the aboriginal condition to that of a great commonwealth comes from the Iowa State Historical Department; and collections serving to fill in the details of the general outline were exhibited by the Franco-Louisiana Society, the Louisiana State Historical Society, the Chicago Historical Society, and other cooperating exhibitors. The picture of progress so drawn was extended backward into the unwritten past of protohistory (or of relics interpreted in the light of observation on peoples of corresponding culture) partly by means of the synthetic series, partly by various exhibits representing the period of transition from Indian occupancy to white supremacy; this outline was then perfected by archeologic collections representing the prehistoric period—and the whole was given meaning and color by the presence on the grounds of living peoples with processes and products corresponding to nearly every step in progress betokened by the protohistoric and prehistoric relics. The typical evidences of human development assembled in the department were enlarged by numerous collections in exhibit palaces and pavilions, and especially in several of the state buildings, of which some were historical replicas, while many contained important historical and protohistoric material.

5. The relics and records indicate that a leading factor in man's development is progressive acculturation, or interchange and unification of knowledge. At first slow and inimical and effected chiefly through strife and conquest, the acculturation of the higher stages is rapid and amicable—schools replace armies, confederation supplants conquest, and the white man's burden of the ballad becomes the strong man's burden in the political family of nations as in the personal family of kindred. Long an accident of intertribal enmity, acculturation becomes, under the principles of constitutional government, an intentional and purposeful means of promoting the common weal; and the United States government has performed no worthier function than that of aiding our aboriginal landholders on their way toward

citizenship. The means and the ends of purposive acculturation as applied to the American aborigines, and the actual processes illustrated by living examples, were exhibited in the typical Indian school forming the most conspicuous feature of the department. Here parents still clinging to native customs and costumes delighted in the progress and achievements of their children in the arts and industries and even in the language and letters required by modern life; here the aboriginal maker of moccasins showed (and saw) the contrast between his craft and modern shoemaking; here the actual transformation from comfortless camp life into comfortable householdry was illustrated not only by every intermediate step, but by the actual passages of individuals and families from the one stage to the other during the exposition period; here the once bloody warrior Geronimo completed his own mental transformation from savage to citizen and for the first time sought to assume both the rights and responsibilities of the higher stage—here, indeed, was illustrated in epitome, and also in the actual progress accelerated by purposive cooperation, a considerable part of that course of intellectual development which raised man from dull-minded and self-centered tribal existence into the active and constructive and broad-minded life of modern humanity.

VI.

In a word, the motive and scope of the department of anthropology were to show our half of the world how the other half lives; yet not so much to gratify the untrained curiosity which leads even the child to look with wonder on the alien as to satisfy the intelligent observer that there *is* a course of progress running from lower to higher humanity, and that all the physical and cultural types of man mark stages in that course.

That the chief aim was gained may not now be claimed; though it can not be doubted that the assemblage of the world's peoples at the Universal Exposition of 1904 gave renewed and fuller meaning to the opinion of Pope that—

> The proper study of mankind is man.

The unbroken tally of visitors to the room containing the Victorian Jubilee Tributes exceeded a million, and the partial tallies in the anthropology building gave a tale approaching a million and a half; the estimated number of visitors to the Indian school building was above three millions, and it seems certain that over four million persons made more or less careful inspection of the alien camps and groups; while the current press items and weightier articles inspired by the anthropology exhibits are conservatively counted as forming at least a quarter and perhaps a third of all of the spontaneous publications pertaining to the fair. The full tale of attendance (total admissions, 19,694,855, not including Sundays; paid admissions, 12,804,616) comprised visitors from nearly every state and some foreign countries who came for the special purpose of seeing the African pygmies, the Ainu, the Filipinos, the Patagonians, or the assemblage of North American tribes; and a feature of the department was a formal 'field school of anthropology,' successfully conducted under the auspices of the University of Chicago, which may be considered the first definite step in cooperation for educational purposes between the permanent university and the temporary exposition. So the assemblage of human types was not only a source of attraction, but served serious ends.

W J McGee.

St. Louis Public Museum.

THE AMERICAN ORNITHOLOGISTS' UNION.

THE twenty-third congress of the American Ornithologists' Union convened in New York City, Monday evening, November 13. The business meeting of the fellows, and public sessions, November 14, 15 and 16, were held at the American Museum of Natural History. The final session, Thursday afternoon, was held at the Brooklyn Institute of Arts and Sciences.

Charles F. Batchelder, of Cambridge, Mass., was elected president; E. W. Nelson, of Washington, D. C., and Frank M. Chapman, of New York City, vice-presidents; John H. Sage, of Portland, Conn., secretary; Jonathan Dwight, Jr., of New York City, treasurer; Ruthven Deane, A. K. Fisher, Thos. S. Roberts, Witmer Stone, William Dutcher, Chas. W. Richmond, and F. A. Lucas, members of the council.

The ex-presidents of the union, Drs. J. A. Allen and C. Hart Merriam, and Messrs. William Brewster, D. G. Elliot, Robert Ridgway and Chas. B. Cory, are *ex-officio* members of the council.

Drs. Allen, Dwight, Merriam and Richmond, and Messrs. Brewster, Ridgway and Stone, were reelected 'Committee on Classification and Nomenclature of North American Birds.'

Walter K. Fisher, of Palo Alto, Calif., Professor Lynds Jones, of Oberlin, Ohio, and Wilfred H. Osgood, of Washington, D. C., were elected fellows. Five associates, Dr. Chas. W. Townsend, John E. Thayer, Rev. Wm. Leon Dawson, James H. Riley and Austin H. Clark, were elected to the class known as members, and seventy-one new associates were elected.

Mr. Witmer Stone had found among the archives of the Philadelphia Academy of Sciences, some unpublished letters of Alexander Wilson, and the extracts read from them were of historic interest—showing the disadvantages under which this pioneer ornithologist labored in his efforts to secure specimens.

A paper, which evoked much discussion, was read by Dr. J. A. Allen, on 'The Evolution of Species through Climatic Conditions.' He referred to certain geographic races described from the United States as illustrating the change of plumage and appearance of birds whose distribution covered a wide area.

Mr. Abbott H. Thayer, the eminent portrait painter, demonstrated his theory of the protective or disguising coloration of animals. Mr. Thayer has studied this subject from an artist's standpoint and believes 'that every animal which preys upon others or is preyed upon is an absolute picture of its environment at its time of greatest danger.' The elephant, he said, had no need of protective coloration.

Mr. C. Wm. Beebe, curator of birds at the New York Zoological Park, spoke of the collection under his charge and referred to many interesting experiments concerning feeding and surroundings, which he had been able to conduct in the park.

Dr. Thos. S. Roberts called attention to the great destruction of Lapland longspurs in southern Minnesota while migrating, March 13, 1904. A severe (moist) snowstorm occurred at the time and thousands of the birds were killed and injured by striking buildings, telegraph wires and the ice on different lakes. A conservative estimate of the number killed was 750,000, but he fully believes that 1,000,000 must have perished. Dr. Roberts illustrated his remarks with lantern slides, picturing the dead or injured birds as found in the snow in door-yards, parks and on various ponds. No other species appeared to be migrating with the longspurs.

During the sessions excellent lantern slides from photographs of birds in life were shown by Rev. H. K. Job, and Messrs. Chapman, Bowdish, Baily and Finley.

After a dinner at the Hotel Endicott, Tuesday evening, November 14, an informal reception was held for the members of the union and their friends, at the American Museum of Natural History.

At the closing session of the union, held at the Brooklyn Institute of Arts and Sciences, Mr. Geo. K. Cherrie had a paper on 'The Hoatzin and other South American Birds.' He traced the life history of different species and exhibited specimens of many of them. Mr. Wm. L. Finley spoke of the water birds of southern Oregon, illustrating what he said by many beautiful lantern slides.

The day following adjournment the members of the union visited the aquarium and the New York Zoological Park, and were received and entertained by Directors Hornaday and Townsend, and Curator Beebe.

Following is a list of the papers read at the sessions:

WITMER STONE: 'Some Unpublished Letters of Wilson and some Unstudied Works of Audubon.'

J. A. ALLEN: 'The Evolution of Species through Climatic Conditions.'

ELON H. EATON: 'Summer Birds of the Mt. Marcy Region in the Adirondacks.'

FRANK M. CHAPMAN: 'Pelican Island Revisited.' Illustrated by lantern slides.

B. S. BOWDISH: 'Some Breeding Warblers of Demarest, N. J.' Illustrated by lantern slides.

WILLIAM L. FINLEY: 'Notes on Wing Movements in Bird Flight.' Illustrated by lantern slides.

J. DWIGHT, JR.: 'The Status of Certain Species and Subspecies of North American Birds.'

HERBERT K. JOB: 'Wild-fowl Nurseries of Northwest Canada.' Illustrated by lantern slides.

C. J. PENNOCK: 'Andreæ Hesselius, a Pioneer Delaware Ornithologist.'

WITMER STONE: 'The Probability of Error in Bird Migration Records.'

WITMER STONE: 'Some Observations on the Applicability of the Mutation Theory to Birds.'

HENRY OLDYS: 'The Song of the Hermit Thrush.'

FRANK M. CHAPMAN: 'Impressions of English Bird-Life.' Illustrated by lantern slides.

WILLIAM L. BAILY: 'Exhibition of Lantern Slides.'

THOMAS S. ROBERTS: 'A Lapland Longspur Tragedy.' Illustrated by lantern slides.

WILLIAM L. BAILY: 'Similarity of the Birds of the Maine Woods and the Pocono Mountains, Pa.'

WELLS W. COOKE: 'Discontinuous Breeding Ranges.' Illustrated by lantern slides.

ABBOTT H. THAYER: 'The Principles of the Disguising Coloration of Animals.' Illustrated with experiments and slides.

C. W. BEEBE: 'The Collection of Birds in the New York Zoological Park.'

DR. MONTAGUE R. LEVERSON: 'Contribution to the Natural History of the English Cuckoo, with a Review of the Literature on the Subject.'

DR. J. DWIGHT, JR.: 'Plumages and Status of the White-winged Gulls of the Genus *Larus*.'

ARTHUR T. WAYNE: 'Contribution to the Ornithology of South Carolina, Pertaining Chiefly to the Coast Region.'

O. WIDMAN: 'Should Bird Protection Laws and their Enforcement be in the hands of the National Government?'

GEORGE K. CHERRIE: 'The Hoatzin and other South American Birds.' With exhibition of specimens.

WILLIAM L. FINLEY: 'Among the Water Birds of Southern Oregon.' Illustrated by lantern slides.

The next annual meeting will be held in Washington, D. C., commencing November 12, 1906.

JOHN H. SAGE,
Secretary.

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A Compendium of Chemistry, Including General, Inorganic and Organic Chemistry. By Dr. CARL ARNOLD, Professor of Chemistry in the Royal Veterinary School of Hanover. Authorized translation from the eleventh enlarged and revised German edition by JOHN A. MANDEL, Sc.D., Professor of Chemistry, Physics and Physiological Chemistry in the University and Bellevue Hospital Medical College. New York, John Wiley & Sons. Pp. xii + 627. 8vo. $3.50.

A Text-book of Organic Chemistry. By WILLIAM A. NOYES, formerly Professor of Chemistry in the Rose Polytechnic Institute, now Chief Chemist in the Bureau of Standards, Washington, D. C. New York, Henry Holt & Co. Pp. xvii + 534. 12mo. $1.50.

Praktische Uebungen zur Einführung in die Chemie. Von Dr. ALEXANDER SMITH, Professor für Chemie an der Universität Chicago. Nach einer vom Verfasser besorgten Umarbeitung der zweiten amerikanischen Auflage ins Deutsche übertragen von Professor Dr. F. HABER und Dr. M. STOECKER. Karlsruhe, Druck und Verlag der G. Braunschen Hofbuchdruckerei.

Experiments Arranged for Students in General Chemistry. By EDGAR F. SMITH, Professor of Chemistry, University of Pennsylvania, and HARRY F. KELLER, Professor of Chemistry, Central High School of Philadelphia. Fifth edition, enlarged, with 40 illustrations. Philadelphia, P. Blakiston's Son & Co. Pp. 92, with blank pages interbound. 12mo. $0.60.

Conversations on Chemistry.—This is the authorized translation of the first volume of Ostwald's 'Die Schule der Chemie,' which was published in 1903. The book has attracted wide attention, not only because of the renown of its author, but also because of the novel way chosen for presenting the subject. In his 'Grudlinien,' translated under the title of 'The Principles of Inorganic Chemistry,' Ostwald has presented the subject to the mature student. In his 'Conversations,' however, the author addresses himself to distinctly elementary pupils. The form chosen for presenting the subject is the dialogue, 'because after several attempts it appeared to me the most suitable; moreover, I have come to the conclusion that it occupies no more space than an ordinary description, while the impression it makes is much more penetrating and lively.' The conversation takes place between the master and the pupil. The topics of conversation include such subjects as substances, properties, solutions, melting and freezing, density, compounds, elements, oxygen, hydrogen, nitrogen, air—thirty topics in all. The following will give an idea of the method of discussion:

Master. Have you ever looked at a candle burning? Yes? Then describe to me what you saw.

Pupil. When you light a candle it burns down till it is all gone, and during this it has a hot, bright flame.

M. Right. What is necessary for burning?
P. Well, the candle.
M. Nothing else?
P. Not that I know of.
M. If you put the burning candle in water—
P. It goes out.
M. Why? What is different from before?
P. It has no more air.

The master then shows by simple experiments and judicious questions that air is necessary for the combustion and that carbon dioxid is formed in the process. The interest and enthusiasm of the pupil lead to many expressions that the translator no doubt had difficulty in rendering in English; thus when the master explodes a mixture of hydrogen and air, the pupil exclaims, 'By jove! what a thundering crack!' and again when the soap bubble inflated with hydrogen rises like a balloon, 'Oh, how ripping!'

The book is not adapted as a text for students; neither could teachers follow it literally. On the other hand, no teacher could read it carefully without gaining much that would be helpful to him in presenting the subject of elementary chemistry. No one who has the knowledge of the 'master' and the happy way of presenting it could fail to attract and interest the pupil. The chief value of the book must lie, therefore, in showing

something of the spirit and the methods best adapted for arousing the interest of young pupils in elementary science.

The second and final volume of the 'Die Schule der Chemie' appeared in 1904. In this volume the author discusses in the same style some of the more important elements and compounds. The translation of this is promised soon.

Newell's Descriptive Chemistry.—This book is true to its title—a descriptive chemistry. In the preface the author tells us that the 'book is intended for teachers who wish to emphasize the facts, laws, theories and applications of chemistry.' The order of treatment is that which has recommended itself to most authors of elementary texts, no attempt being made to follow strictly the periodic classification; in fact the discussion of the periodic law is postponed until the next to the last chapter in the book. The book is divided into two parts. The first part consists of 436 pages of text with an appendix of 15 pages. The second part (100 pages) contains the experiments. There is an index of 36 pages.

The general subject is treated in a comprehensive and interesting way. As the title would indicate, considerable space is given to the applications of chemistry. Thus nearly four pages are devoted to the manufacture of coal gas. The theoretical side, however, has not been neglected. The experiments are well chosen and are such as can be performed readily by elementary students. But few quantitative experiments are included. At the end of each chapter is a complete list of questions on all the topics discussed in the chapter.

The book is a companion volume to the author's 'Experimental Chemistry.' These two books, 'The Experimental Chemistry' and 'The Descriptve Chemistry,' seem to the reviewer to represent rather the extreme views of the advocates of the two methods of teaching chemistry. It is a question whether the good features of the two could not be combined, making a text which would meet the approval of a larger number of teachers. It is doubtful whether the complete lists of questions appended to each chapter add to the value of the book. It is certain that many students will turn at once to these lists and the book then degenerates into a sort of catechism.

A number of full-page cuts of distinguished chemists add to the appearance and value of the book.

Muir's Elements.—According to the preface, the objects of the book are: "To present some of the fundamental facts, generalizations, principles and theories of chemistry, lucidly, methodically and suggestively, to train the student in a few of the methods of investigation and reasoning which have been used in the past and some of the methods which are used to-day, for discovering and coordinating the connections between the properties and the compositions of systems of homogeneous substances; to attempt to lay the foundations of chemistry in such a way that the student may be prepared for going more deeply into the science, if he wishes so to do." The author also adds: "I hope I have not merely added one more illustrated catalogue of chemical odds and ends to the many which have already appeared under the title of 'A Text-book of Chemistry.'" Surely the author has 'hitched his wagon to a star.'

The book is divided into twenty-six chapters. Of these the first five are devoted to the definitions of chemical terms, the statement of the laws of combination, the determination of the combining weights of elements and the reacting weights of compounds and the representation of interactions by means of formulas and equations. Then follows a study of hydrogen, oxygen, nitrogen, sulphur, potassium, sodium, iron (note the order) and other elements, with chapters interspersed on oxidation and reduction, the molecular and atomic theory, the periodic law and the measurement of thermal values of chemical changes.

The text is similar to Ostwald's 'Grudlinien' in that the molecular and atomic theories are given comparatively little prominence. Thus while the first half of the book abounds in formulas and equations, these are all explained from the standpoint of combining weights and reacting weights, the latter term being defined as 'the quantity by weight of the com-

pound denoted by the expression of its composition by the smallest possible whole numbers of combining weights of the elements which form it.' The atomic theory is first mentioned on page 341, Avogadro's law on page 352. Considerable prominence is given to energy changes accompanying chemical changes. Many references to and quotations from the writings of Dalton, Davy and others impart an historical flavor to the book. An appendix of fourteen pages treats of the general characters of the eight groups of elements.

The author has certainly been successful in not producing 'a catalogue of chemical odds and ends.' Whether the method of treatment is an improvement upon the more common methods is a question that must be decided by trial in the lecture room.

Noyes's Organic Chemistry.—The author states in his preface that "an attempt is here made to present the fundamental principles of organic chemistry for the use of those beginning the subject. The most radical departure from the method of treatment adopted in other books treating of the same subject consists in the dropping of the division into 'fatty' and 'aromatic' compounds and in the adoption of what appears to the author a more fundamental and logical classification."

The subject-matter is divided into twenty-five chapters. Of these, chapters I. and II. deal with purification and analysis of compounds, the determination of molecular weights and formulas and a general discussion of the physical properties of organic compounds. Chapters III. to VIII., inclusive, treat of the hydrocarbons. In chapter IX. is given the classification of the derivatives of the hydrocarbons. The remaining chapters are devoted to a discussion of these derivatives.

The most striking feature of the book undoubtedly lies in the fact that the time-honored classification of the compounds into the so-called 'fatty' and 'aromatic' classes is set aside and the corresponding members of each class discussed together. While this is a very radical departure, there is no question but that the method chosen is a logical one and at least well worth a trial in the lecture room. The book bears unmistakable evidence that its author has been an enthusiastic worker in the field of organic chemistry and that he has given to the student, in so far as the space would permit, a clear and comprehensive discussion of the science as it exists to-day. It is a question whether some of the general reactions discussed might not have been illustrated by simpler examples. As the author states in his preface, however, 'no two authors would make the same selection, and that here given is doubtless open to just criticism at some points.'

To write an elementary text in a science which includes a study of over 100,000 compounds besides a number of growing theories is not an easy task, and the person who does this successfully is certainly deserving the commendation of the teachers of the science. Noyes's text must be regarded along with Remsen's as the best of modern elementary texts of organic chemistry.

Smith's Praktische is the German translation of his well-known 'Laboratory Outline of General Chemistry,' which is undoubtedly one of the best of the 'laboratory outlines' for mature students.

Smith and Kellar's Experiments has deservedly reached its fifth edition. The experiments are well chosen to illustrate the principles of chemistry. A number of quantitative experiments are included.

WILLIAM MCPHERSON.

SCIENTIFIC JOURNALS AND ARTICLES.

The Journal of Experimental Zoology for November, 1905. T. H. Morgan ('Polarity' considered as a phenomenon of gradation of material) discusses in the light of some new experiments with the hydroid Tubularia the so-called 'polarity' of organisms, as seen especially in the phenomenon of regeneration. The author advances the hypothesis that organic 'polarity' is an expression of the gradation of the organ-forming substances present in the adult. These substances are traceable to the egg, which owes its development in part to their localization. The phenomena of development and of regeneration are thus brought under a common point of view. H. S.

Jennings, in a paper entitled 'Modifiability in Behavior. I. Behavior of Sea Anemones,' shows that the course of the internal physiological processes, the past experience of the organism, and various other internal factors, partly determine the behavior of sea anemones and modify fundamentally their reactions to external stimuli. In a second paper entitled 'The Method of Regulation in Behavior and in other Fields,' the same author gives a general outline of the method of regulation shown in the behavior of the lower organisms. E. B. Wilson's 'Studies on Chromosomes,' No. II., deals with some of the specific classes of chromosomes in the *Hemiptera*, and their history in the maturation phenomena, and is intended to clear the ground for a study of the sexual relations of the chromosome groups. An appendix records facts, determined by later observations, that give complete confirmation of the theoretic expectations regarding the sexual relations, stated in the general discussion. (See issue of SCIENCE for October 20, 1905.) Chas. W. Hargitt (Variations among Scyphomedusæ), gives a detailed study of the variations found in *Aurelia flavidula*, with a view to determine their relations to the problems of adaptation and natural selection. Lorande Loss Woodruff (An Experimental Study of the Life-History of *Hyptrichous Infusoria*), describes five cultures, all of which passed through cycles of greater and less general vitality as measured by the rate of division. Recovery from a period of extreme depression was effected by extract of beef. Minor fluctuations occurred which are termed 'rhythms' and are to be clearly distinguished from cycles. A description is given of the cytoplasmic and nuclear changes during the life-cycle, as well as of a series of experiments on the effect of salts on the division rate.

SOCIETIES AND ACADEMIES.

THE CONVOCATION WEEK MEETINGS OF SCIENTIFIC SOCIETIES.

There will meet at New Orleans:

The American Association for the Advancement of Science.—The week beginning on December 28. Retiring president, Professor W. G. Farlow, Harvard University; president-elect, Professor C. M. Woodward, Washington University, St. Louis, Mo.; permanent secretary, Dr. L. O. Howard, Cosmos Club, Washington, D. C.; general secretary, Professor C. A. Waldo, Purdue University, Lafayette, Ind.; secretary of the council, Dr. John F. Hayford, U. S. Coast and Geodetic Survey, Washington, D. C.

Local Executive Committee.—Honorary president, President E. B. Craighead, Tulane University; executive president, Professor George E. Beyer, Tulane University; secretary, Henry M. Mayo, The New Orleans Progressive League; treasurer, Mr. Clarence F. Low, of the Liverpool, London and Globe Insurance Company.

Section A, Mathematics and Astronomy.—Vice-president, Dr. W. S. Eichelberger, U. S. Naval Observatory, Washington, D. C.; secretary, Professor L. G. Weld, University of Iowa, Iowa City, Iowa.

Section B, Physics.—Vice-president, Professor Henry Crew, Northwestern University, Evanston, Ill.; secretary, Professor Dayton C. Miller, Case School of Applied Science, Cleveland, Ohio.

Section C, Chemistry.—Vice-president, Professor Charles F. Mabery, Case School of Applied Science, Cleveland, Ohio; secretary, Professor Charles L. Parsons, New Hampshire College of Agriculture, Durham, N. H.

Section D, Mechanical Science and Engineering.—Vice-president, Professor F. W. McNair, Houghton, Mich.; secretary, Professor Wm. T. Magruder, Ohio State University, Columbus, Ohio.

Section E, Geology and Geography.—Vice-president, Professor Wm. North Rice, Wesleyan University, Middletown, Conn.; secretary, Dr. Edmund O. Hovey, American Museum of Natural History, New York, N. Y.

Section F, Zoology.—Vice-president, Professor Henry B. Ward, University of Nebraska, Lincoln, Nebr.; secretary, Professor C. Judson Herrick, Denison University, Granville, Ohio.

Section G, Botany.—Vice-president, Dr. Erwin F. Smith, U. S. Department of Agriculture, Washington, D. C.; secretary, Professor F. E. Lloyd, Teachers College, Columbia University, New York, N. Y.

Section H, Anthropology.—Vice-president, Dr. George Grant MacCurdy, Yale University, New Haven, Conn.; secretary, George H. Pepper, American Museum of Natural History.

Section I, Social and Economic Science.—Professor Irving Fisher, Yale University, New Haven, Conn.; secretary, Dr. J. F. Crowell, Bureau of Statistics, Washington, D. C.

Section K, Physiology and Experimental Medicine.—Vice-president, Professor Wm. T. Sedg-

wick, Massachusetts Institute of Technology, Boston, Mass.; secretary, Dr. Wm. J. Gies, College of Physicians and Surgeons, Columbia University, New York City.

At New Orleans in conjunction with the American Association for the Advancement of Science there will meet:

The American Chemical Society.—President. F. P. Venable, University of North Carolina; secretary, Dr. William A. Noyes, the Bureau of Standards, Washington, D. C.

The Botanical Society of America.—January 4. President, Professor R. A. Harper, University of Wisconsin; secretary, Dr. D. T. MacDougal, N. Y. Botanical Garden, Bronx Park, New York City.

The Association of Economic Entomologists.—January 1, 2, 3. President, Professor H. Garman, Lexington, Ky.; secretary, Professor H. E. Summers, Ames, Iowa.

The Society for Horticultural Science.—December 27. President, Professor L. H. Bailey, Cornell University; secretary-treasurer, V. A. Clark, Phœnix, Ariz.

The American Mycological Society.—January 1–4. President, Chas. H. Peck, state botanist, Albany, N. Y.; secretary, C. L. Shear, U. S. Department of Agriculture, Washington, D. C.

The Southern Society for Philosophy and Psychology. President, Professor J. Mark Baldwin, The Johns Hopkins University; secretary, Professor E. F. Buchner, University of Alabama.

At Ann Arbor will meet:

The American Society of Naturalists.—President, Professor William James, Harvard University; secretary, Professor W. E. Castle, Harvard University. President (Central Branch), Professor H. H. Donaldson, University of Chicago; secretary, Professor W. J. Moenkhaus, Indiana University. The Eastern Branch will not meet this year.

The American Society of Zoologists (Eastern and Central Branches).—December 28, 29, 30. President (Eastern Branch), Professor W. E. Castle, Harvard University; secretary, Professor H. S. Pratt, Haverford College. President (Central Branch), Professor Frank R. Lillie, University of Chicago; secretary, Professor C. E. McClung, University of Kansas.

The Society of American Bacteriologists.—December 28, 29. President, Professor Edwin O. Jordan, University of Chicago; secretary Professor Frederic P. Gorham, Brown University, Providence, R. I.

The American Physiological Society.—December 27, 28. President, Professor W. H. Howell, the Johns Hopkins University; secretary, Professor Lafayette B. Mendel, New Haven.

The Association of American Anatomists.—December 27, 28, 29. President, Professor Charles S. Minot, Harvard Medical School; secretary, Professor G. Carl Huber, 333 East Ann St., Ann Arbor, Mich.

The Society for Plant Morphology and Physiology.—December 27, 28, 29. President, Professor E. C. Jeffrey, Harvard University; secretary, Professor W. F. Ganong, Smith College, Northampton, Mass.

At New York City will meet:

The Astronomical and Astrophysical Society of America.—December 28. President, Professor Simon Newcomb; secretary, Professor Geo. C. Comstock, Washburn Observatory, Madison, Wis.

The American Physical Society.—December 29, 30. President, Professor Carl Barus, Brown University; secretary, Professor Ernest Merritt, Cornell University, Ithaca, N. Y.

The American Mathematical Society.—December 28, 29. President, Professor W. F. Osgood, Harvard University; secretary, Professor F. N. Cole, Columbia University.

The American Paleontological Society.—December 27, 28. President, Professor William B. Scott, Princeton University; secretary, Dr. Marcus S. Farr, Princeton University.

At Cambridge will meet:

The American Psychological Association.—December 27–29. President, Professor Mary Whiton Calkins, Wellesley College; secretary, Professor Wm. Harper Davis, Lehigh University.

The American Philosophical Association.—December 27–29. President, Professor John Dewey, Columbia University; secretary, Professor John Grier Hibben, Princeton University.

At Ithaca will meet:

The American Anthropological Association.—December 27–29. President, Professor F. W. Putnam, Harvard University; secretary, Dr. Geo. Grant MacCurdy, Yale University, New Haven, Conn.

At Ottawa will meet:

The Geological Society of America.—December 27, 28, 29. President, Professor Raphael Pumpelly; secretary, Professor Herman L. Fairchild, Rochester, N. Y.

THE BIOLOGICAL SOCIETY OF WASHINGTON.

THE 404th regular meeting of the Biological society was held October 28, 1905, with President Knowlton in the chair and 66 persons present. Mr. A. A. Doolittle presented a specimen of a peculiar form of fruit of walnut (*Juglans*) recently picked up by one of the high school pupils. Dr. A. D. Hopkins made note of two species of bark beetles so destructive of forest trees in Colorado that they render the forests more liable to fire because of the increased amount of dead and fallen timber. Dr. H. M. Smith noted the unusual occurrence of so many woodcock in the vicinity of Washington, especially on the Maryland side of the Potomac River between Washington and Indian Head. Dr. T. S. Palmer reported the bagging of 96 woodcock. Dr. Smith also noted the capture of a reed bird near Washington a few days since in the spring plumage of the bobolink. Dr. Knowlton reported the presence of wild geese, recently, in a garden at Laurel, Maryland; and also of a loon, the latter apparently wounded. Mr. H. W. Oldys presented, with whistled notes, a song of a hermit thrush recently under his observation.

For the first paper of the evening, on 'The Changes in the Bird Life on an Indiana Farm during Recent Years,' Dr. B. W. Evermann gave a list of the birds (48 species) which he observed during a week's stay (June 25 to July 1) on a farm in Carroll County, Indiana, and called attention to some of the changes in the bird life of that region in recent years. Attention was called to the physical conditions existing there thirty years ago—the heavy forests, the large swamps, the numerous smaller ponds—and these were contrasted with present conditions—forest largely cut off and the underbrush cleared away, the swamps drained and now in corn and cabbage, and the ponds all gone, and with them practically all the swamp-loving birds as well as those that love the forest. These changes are especially noticeable with the crow blackbirds, red-shouldered blackbirds, herons, bitterns, golden swamp warblers and the like; also the woodpeckers, bluebirds, tanagers, orioles and warblers. Discussion followed by Mr. Kallock.

The second paper was by Dr. L. O. Howard, giving 'Some Notes on the Yellow-fever Mosquito.' Discussion followed by Dr. Carroll, of the U. S. Army, who particularly noted that *Stegomya* bites negroes in Washington, though rarely in yellow-fever countries. Mr. Schwarz noted that the mating *Stegomya* has not been seen by him in Cuba, and that none of this genus are flying at the time of day, about five in the afternoon, at which *Culex pipiens* is abundant and mating.

For the third paper on 'An American Cretaceous Chimæroid Ovicapsule,' Dr. Theodore Gill exhibited the impression of a Cretaceous chimæroid ovicapsule from the vicinity of Laramie, Wyoming, originally submitted to him for identification by Dr. Frank H. Knowlton and now in the custody of Dr. T. W. Stanton, in the National Museum. It is the first of the kind noticed in the United States and is interesting on account of its resemblance to the ovicapsules of chimæroids of the family of Harriottidæ found in the deep seas of the Atlantic and Pacific. It is also important as an indication of the structural features of the chimæroids of the Cretaceous period. The previously known ovicapsules of chimæroids of Mesozoic age had been obtained from Jurassic beds of Würtemberg and indicated a relationship of their makers to the callorhynchids. This paper was discussed by Dr. Stanton.

E. L. MORRIS,
Recording Secretary.

THE PHILOSOPHICAL SOCIETY OF WASHINGTON.

THE 607th meeting was held on November 18, 1905.

Mr. Burbank spoke informally on the recent observations on terrestrial magnetism in Labrador; disturbances in the declination amounting to 1° 50″ were noted.

Mr. E. Buckingham presented a paper on 'The Capillary Motion of Water in Soils.'

Previous work by the speaker showed that the rate at which carbonic acid and air mix by diffusion through layers of soil is approximately proportional to the square of the porosity of the soil. Experiments on water vapor and air appear to give the same result. The experiments also showed that the loss of water

by direct evaporation from depths of over two inches in the rock must in general be insignificant from an agricultural point of view, hence if the capillary flow of water upward can be nearly stopped an inch or two below the surface by the formation of a dry surface layer, the wasteful loss of water by evaporation will be much decreased.

Laboratory experiments by Mr. J. O. Belz in the physical laboratory of the Bureau of Soils, in which arid and humid climatic conditions were simulated, showed that such a dry layer may be formed naturally under very arid conditions. A very rapid initial evaporation forms a dry surface layer, and the rate of evaporation then falls off very greatly, the result being that in the long run the total loss of water from the soil is less under very arid conditions than under humid conditions. Under arid conditions, a soil has thus an automatic tendency to protect itself from the great loss of water which would at first sight be expected to occur under such conditions.

Mr. Briggs applied these principles to the conditions of desert plants.

Mr. J. C. Blake then read a paper on 'The Electrical Behavior of Colloidal Mixtures.'

The early work of Quincke and others on the migration of visible particles was shown to be in accord with the recent work on 'Colloids.' The rate of migration of visible particles as well as of colloids is almost identical with that of the common ions in electrolytic solution. It was shown that each colloidal particle is probably accompanied by an ion, which causes the migration of the particle, the ion and colloidal particles being surrounded by an electric double layer. The absolute conductivity of the colloidal material in a colloidal mixture agrees with the idea that each colloidal particle carries the ionic charge. Hence colloidal mixtures are to be regarded as true solutions largely ionized, one of the ions being associated with the colloid.

CHARLES K. WEAD,
Secretary.

THE NEW YORK ACADEMY OF SCIENCES. SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

AT a meeting held November 27, 1905, in conjunction with the New York Section of the American Psychological Association, Professor Woodbridge occupying the chair, Professor Robert MacDougall was elected chairman for the coming year, and Professor R. S. Woodworth secretary. The following papers were presented:

Smell Discrimination of Students: WILL S. MONROE.

A statistical inquiry into the ability of 255 girls to recognize odors showed that, on the average, 6.72 out of a set of 20 common odors, chiefly essential oils, were correctly named. Those most often identified were wintergreen, camphor, peppermint, vanilla and cloves; those least often, hemlock, bergamot, asafœtida, wormwood and lavender. A census of odor names showed that some of those least often recognized, as lavender, were believed to be familiar. The fact is simply that people do not know as many odors as they suppose.

Linguistic Standards: FREDERIC LYMAN WELLS.

The speaker contended that the current standards of 'good use,' based as they are on the individual introspection of rhetoricians, or on a reactionary adherence to selected historical models, were not adequate to the changing needs of a language. By the application of statistical methods, it is possible to obtain standards that are free from the arbitrariness of one-man introspection, and also furnish, in the 'probable error,' a measure of their own validity. A statistical study of the relative 'force' of synonyms yielded results having a very small probable error, which nevertheless did not agree with any of the definitions of force which the introspective grammarians have laid down.

A Threshold Study of the Reading Pause: F. M. HAMILTON.

The author showed how the tachistoscopic method could be adapted to the reading not only of isolated words, but also of sentences and paragraphs; to the analysis of processes at the threshold of word recognition; and to the study of the marginal field of perceptual regard. Light is thrown by these experiments upon the questions of literal reading, reading cues, value of context, etc.

Vision and Localization during Rapid Eye Movements: R. S. Woodworth.

The author sought to show that vision occurs during movements of convergence, and also in rapid 'jumps' of the eye from one fixation point to another. The latter fact is best shown by the clear vision of a rapidly moving object that occurs when the eye moves in the same direction and with the same speed as the object. This can not be explained, as has been attempted, by supposing that only an after image of the impression received during the eye jump comes to consciousness, for the object is not only seen, but correctly localized in space.

The Measurement of Scientific Merit: J. McKeen Cattell.

A method was explained by which it was possible to select a group of the leading 1,000 men of science of the United States for the study of individual differences and by which degrees of scientific merit could be measured. The more eminent scientific men are distributed in accordance with the positive half of the curve of error, the first hundred differing among themselves about as much as the next two hundred or the last seven hundred. Data were also given in regard to the distribution of scientific men, including their birthplace, their place of residence and the institutions with which they are connected.

Temperament as Affecting Philosophic Thought: Brother Chrysostom.

It was urged that the temperament of a philosopher was so potent a factor in determining his emphasis of certain doctrines, his introduction of illogical views and his personal influence in the founding of his school, that it must be considered in order to understand his philosophy. Heredity, environment, race, epoch, the personality of the philosopher and of the master who first influenced him, were mentioned as elements in the temperamental complex that determines the cast of his thought.

Are Mental Processes in Space? W. P. Montague.

The paper consisted in a protest against the current view of mental processes as real occurrences that occur nowhere, and an attempt to show that they could exist in space without being either punctiform or figured (compare sounds and odors), and without displacing matter or being wedged into the spaces between material particles (compare stresses, velocities and accelerations). Potential energy, like mental action, exists in space without being visible and without displacing matter. Both are localized intensive states; and it was suggested that mental processes may be forms of potential energy into which the kinetic energy of the nerve currents must be transformed in order to be redirected.

R. S. Woodworth,
Secretary.

DISCUSSION AND CORRESPONDENCE.

THE THEORY OF ISOLATION AS APPLIED TO PLANTS.

President Jordan, in his opportune and clearly stated paper on 'The Origin of Species through Isolation,'[1] has suggested the following as a general law:

> Given any species in any region, the nearest related species is not likely to be found in the same region nor in a remote region, but in a neighboring district separated from the first by a barrier of some sort.

This we were inclined to accept as applicable to plants with little or no hesitation.

For several years the writer has studied, more or less critically, the plants of a well-defined floral region, and it has almost invariably been his experience that the difficult problems which confronted him were not the discrimination of the various species of a given locality or region, but the question of the relationship of his plants to similar forms occurring in another, usually adjoining, territory.

Consequently it was with considerable surprise that we read Professor Lloyd's[2] bold assertion that, if the general law stated by President Jordan were put in the converse form, 'it would be more in harmony with the facts in the case as understood by the botanists.'

In addition to the general and 'sweeping'

[1] Science, II., **22**: 545–562. November 3, 1905.
[2] Science, II., **22**: 710–712. December 1, 1905.

statements Professor Lloyd has offered a few specific illustrations, as well, to uphold his point, and, if we infer correctly, these are chosen from a great number of cases which he considers applicable. We naturally assume, therefore, that they are examples which he thought most conclusive. How well these really substantiate his assertions, however, can only be ascertained by carefully considering the merits of each illustration. And in doing this two predominant questions must be kept clearly in mind: (1) Are we dealing with the *most closely* related species? (2) Are the two species growing associated under the same conditions?

Viewed from this standpoint some of Professor Lloyd's illustrations not only do not agree with his assumption, but offer excellent examples of the general law suggested by President Jordan. For instance, *Viola lanceolata* and *V. primulæfolia,* we are led to infer, are associated with each other in the same habitat, a fact upon which at least one well-known authority is very skeptical. But, granting that they do so occur, are they more closely related to each other than to some other species? Three students of the genus whom I have consulted are unanimous in the opinion that they are not. On the contrary, *V. lanceolata* has its closest relative in *V. vittata* of the gulf states, while *V. denticulosa,* also of the southern region, holds a similar relation to *V. primulæfolia.* Both *V. lanceolata* and *V. primulæfolia,* therefore, have their closest relatives not associated with them, but growing in adjoining regions, separated by one of nature's well-marked barriers, that of temperature.

Again, *Rhodiola integrifolia,* it is claimed, occurs associated with *R. polygama* in Colorado, a statement which, it is true, we are unable to refute; but one of the recognized authorities of this genus does not hesitate to assert that *R. alaskana* and not *R. polygama* is the species nearest *R. integrifolia.* Both of these occur in Alaska, but there, too, is the barrier intervening; for while *R. integrifolia* is an alpine plant, *R. alaskana* is confined to the coastal region.

Fern students will not agree that *Dryopteris marginalis* and *D. goldiana* are the two more closely related species in that group. On the contrary, *D. goldiana* is usually considered most closely related to that far northern and western plant known as *D. filix-mas.*

If the opportunity were afforded and if we were able to gather the necessary data doubtless nearly all of Professor Lloyd's examples would be found fully as misleading. Enough have been refuted, however, to clearly show that we are not to accept his statements as at all conclusive.

Furthermore, our fellow botanist states, as his opinion, that it is easier to find exceptions to President Jordan's rule than facts in support of it. With this assertion we believe it absolutely impossible for any botanist to agree who is at all familiar with plants in the field, or who has ever given the question of geographical distribution any serious consideration. The writer most assuredly does not find that difficulty. Many cases among the plants with which he is most familiar in the field are brought to mind; some of which he will take the liberty of presenting for the careful consideration of those interested in this general discussion.

It may be well to state in the beginning that the examples chosen are limited mainly to the flora of the California province, partially because the writer is more familiar with the plants of that region, but also because the barriers are more clearly defined there and can be more readily appreciated.

Among the conifers of the Pacific coast are several suggestive illustrations of the isolation theory. For instance, we find *Pinus contorta* along the northern seacoast, while on the mountains is its very near relative *P. murrayana.* Again, *Pinus ponderosa* of the Pacific slope is represented in the Rocky Mountains by *P. scopulorum. Pseudotsuga mucronata* is replaced in southern California by *P. macrocarpa,* while *Cupressus macrocarpa* of Monterey Bay and *C. goveniana* of the northern coast ranges of California are two closely related species.

Castanopsis chrysophylla of the coast ranges has its nearest relative in *C. sempervirens* of the Sierra Nevada. The same may be said

of *Garrya rigida* and *G. fremontii*, and a host of others.

The genus *Rhamnus*, as represented on the Pacific slope, offers some excellent illustrations. *Rhamnus californica* of the coast ranges of central California has at least two very near relatives occurring in adjoining regions. *R. purshiana* of the northwest region and *R. tomentella* of the foothills of the Sierra Nevada and southern California. And, as we would naturally suspect, from the theory of isolation, the species occurring in central California is the intermediate one.

Ceanothus integerrimus (*C. andersoni*) of the Santa Cruz Mountains, *C. nevadensis* of the Sierra Nevada and *C. puberulus* of the San Bernardino Mountains are three very closely related species occurring in three different mountain ranges of the California province.

Adenostegia rigida of the coast ranges of central California, *A. filifolia* of southern California, and the Sierra Nevada form, not yet clearly defined, but bearing the name *A. rigida brevibracteata*, are, also, three very closely related species, clearly marked in the more isolated portions of their ranges, but apparently intergrading where the three ranges converge.

In southern California may be found other illustrations fully as conclusive. The flora of this region is naturally very similar to the more typical Californian flora, but it also has certain affinities with that of the Arizona region. Here occurs *Quercus engelmanni*, and it is in the Arizona region that we find its closest relative, *Q. oblongifolia*. Again, *Euphorbia palmeri* is represented in Arizona by *E. palmeri peplifolia* and *Ceanothus palmeri* by *C. myrianthus*.

The coastal and desert regions of southern California also present some well-marked examples. In this connection we need only suggest *Eriogonum fasciculatum* and *E. polifolium*, *Stenotus linearifolius* and *S. interior*, *Bebbia juncea* and *B. aspera*.

On the mesas about San Diego is the very common shrub, *Adenostoma fasciculatum obtusifolium*, which is wholly replaced northward by the typical form. Again *Calochortus weedii*, also limited to the same general region, is replaced by *C. weedii purpurascens* in the vicinity of Los Angeles and Santa Barbara.

In the above illustrations it will be noted that the species selected are very closely related. Some may be inclined to criticize this and it may be argued that the plants mentioned are, at least in some cases, not distinct species. This we are perfectly willing to admit as plausible. They may be only subspecies; but they are, nevertheless, just as suggestive of the isolation theory.

We do not wish it understood, however, that we consider isolation the direct cause of the origin of species; but, whatever the cause, we do maintain that the evidence in favor of isolation as an important factor in the *perpetuation* of closely related species is almost overwhelming in plants as well as in animals. And any theory of evolution which will not allow for this fact can not possibly prevail.

LeRoy Abrams.
United States National Museum.

GROUND ROCK FOR FERTILIZING PURPOSES.

To the Editor of Science: For several years the Division of Tests which is now attached to the Office of Public Roads has been investigating, in connection with the study of macadam road materials, the cause of the binding power of rock dust. These investigations have led to the conclusion that the decompositions that take place in rock powders under the action of water, when in a very fine state of subdivision (180-mesh and finer), and especially when the grinding has been done wet, bear upon a great many practical problems, some of which are of the very highest importance.

It appeared in fact that many of the feldspathic rocks which are more or less rich in potash might be made directly available as a fertilizing material. Although somewhat out of the line of experimentation of this office, under proper authorization the writer conducted a series of experiments on tobacco seedlings which showed that fine-ground orthoclase was very nearly, if not quite, as efficient as a source of potash plant food as the more

soluble potash salts which are in ordinary use. After these experiments were concluded the attention of the writer was called by Dr. F. K. Cameron to the fact that the value of ground orthoclase as a fertilizer had been pointed out by several investigators in the past, notably by Magnus in Germany (1850), Aitken in Scotland (1887) and by the Maine State Experiment Station and the Colorado Experiment Station (1889 and 1901) in our own country.

A paper is being prepared to be published in due time which will present all the information so far obtained upon this subject. This country is at present dependent upon foreign sources of supply for all the potash used annually for fertilizer by our farmers and growers, and in case of foreign wars, embargoes or reprisals, we should be cut off from a steady source of supply. The great stimulus that has been given by our growing cement industry to the art and economics of the milling of rocks to almost flour-fineness makes it possible to-day to consider the feasibility of grinding, not only some of our feldspar deposits, but even our richer potash-bearing feldspathic rocks, like some of the granites which we possess in unlimited quantities. To the proper solution of a problem of this kind it is necessary to enlist the interest and attention of men familiar with the economics of rock grinding and the handling and transportation of material in bulk, as well as of growers and experimental agriculturists. The object of this communication is to call attention to the interest and importance of the problem, and to open the field to all who are desirous of experimenting or of making actual use of ground rock for fertilizing purposes.

ALLERTON S. CUSHMAN.
OFFICE OF PUBLIC ROADS.

SPECIAL ARTICLES.

ZIEGLER'S THEORY OF SEX DETERMINATION, AND AN ALTERNATIVE POINT OF VIEW.

IN his recent pamphlet entitled 'Die Vererbungslehre in der Biologie' Professor H. E. Ziegler proposes a new theory of sex determination. It was said even at the time of Drelincourt that no less than 262 groundless theories of sex had been suggested; and it may be added that since that time there has been no falling off of interest in the sex question if the number of new theories proposed is a criterion.

Ziegler attempts to bring the question of sex determination under the prevailing view of specific chromosomal action. In recent years cytological speculation has largely rested on the assumption that the chromosomes are the sole bearers of the hereditary qualities. Hence all questions of inheritance have been referred to them, and in consequence their changes in the cell have attracted extraordinary attention. Many theories of heredity have been based on the shifting changes in the chromosomes alone. Their capacity for stains has greatly facilitated their study, while the rest of the cell that does not show much differentiation in staining capacity has been often ignored. Only in the case of the egg has the cytoplasm received anything like adequate treatment. The experimental work of Driesch, and of Wilson, in particular, has shown the important rôle that the cytoplasm plays in development.

Ziegler's primary assumption is that the chromosomes that arise from a female individual have a greater tendency to produce a female; and those that originate from a male individual have a greater tendency to produce a male. Since the child gets as many chromosomes from the father as from the mother, the parental chromosomes as such can not determine the sex. But it is to be recalled that amongst the parental chromosomes some have come from the grandfather and some from the grandmother. The relative number of chromosomes from the maternal and paternal lines will be variable in number on the current assumption that at the reduction division it is merely a question of chance which member of a pair of homologous chromosomes goes to one pole of the spindle, and which to the other. If the chromosomes of the grandfather predominate in the offspring it will be a male; if the grandmother chromosomes predominate a female develops.

To take an example. If the somatic num-

ber of chromosomes for the human species be assumed to be 24; the child gets 12 from the father and 12 from the mother. If amongst the former there are 8 grandmother chromosomes and amongst the latter 7 grandmother chromosomes the child will be a girl, for there are at least 15 of the 24 derived from the grandmothers' side.

Ziegler admits that his grandmother theory of sex will not apply to all cases. The 'peculiar' methods of reproduction of the honey bee, the gall wasps, the daphnias, rotifers, and *Dinophilus* can not, be says, be explained in this way. This admission is in itself a serious objection to the theory, for any satisfactory theory of sex must be prepared to account for this class of cases, that can not be put aside by calling them 'peculiar.' But there are other and more serious objections to be urged against Ziegler's view.

In the first place, Ziegler's theory is only a special application of the *differential* chromosome theory, which Sutton first suggested might account for the Mendelian ratio. Boveri has recently followed Sutton's interpretation, and Ziegler also, it appears now, adopts this point of view. Let us look for a moment more closely at this hypothesis, since it has an important bearing on Ziegler's assumption in regard to sex. Two views, both purely hypothetical, may be held as to the way in which the chromosomes represent the heredity qualities. Either, each chromosome contains only one set of characters, *i. e.*, the chromosomes are all different in regard to their hereditary material, or, they are all alike in this respect. Mendel's law is sometimes worked out on the former supposition, and appears to give a satisfactory explanation of how the *assumed* purity of the germ cells of hybrids may arise. On the other supposition, viz., that the chromosomes are all alike, it is difficult to explain the supposed purity of the germ cells of hybrids. In fact, on this supposition it can rarely happen that the germ-cells are pure in respect to any one character. If we reject the assumed purity of the germ-cells in Mendelian cases, and still attempt to explain the Mendelian ratio on our second assumption, viz., that the maternal or the paternal chromosomes are all alike, we can give a formal solution for some cases provided we assume that the reduced number of chromosomes is an unequal one; for, the results may then depend on whether more of the grandfather chromosomes or more of the grandmother chromosomes happen to get into a particular cell. But if we examine the list of cases given by Ziegler himself we find that the reduced number of the chromosomes is an even one in 29 species, and odd only in 10.

On Ziegler's theory of sex it is evident that whenever the reduced number of chromosomes is even there must often occur an exact balance of grandmother and grandfather chromosomes, hence the child can have no sex at all! For a small number of chromosomes this would often occur.

There is also a serious difficulty in the case of the other assumption that chromosomes are individually different. The peculiar inheritance of the Mendelian extracted recessives is difficult to understand from this point of view. For example, if a white mouse is bred to a gray mouse gray offspring will be obtained. If these gray offspring are inbred they give some gray and some white according to the Mendelian ratio. These white mice (extracted) are assumed to have been formed by pure white-bearing germ cells meeting white-bearing germ cells, but that this explanation will not account for their origin is shown by crossing these extracted white mice with black mice. The offspring will be gray according to Cuénot. This must mean that the extracted whites must contain gray in a latent condition, and moreover in sufficient amount to dominate the black color of the black mouse. Cuénot who has discovered this and similar facts offers an hypothesis to account for them, but it is an hypothesis far removed from the chromosome theory as applied to Mendelian cases, at least in the form maintained by Ziegler. Since neither assumption in regard to the chromosomes is capable of explaining certain results of the Mendelian cases the most obvious conclusion is that the germ cells are not 'pure,' and that the Mendelian ratio is not due to this sort of purity but to dominance and recessiveness of contrasted charac-

ters that depend on some other relation in the germ cells than that brought about by the shifting of the chromosomes in the reduction division to produce 'pure' gametes.

Ziegler's failure to give a satisfactory account of sex determination on the *differential* chromosome basis raises the wider question as to whether at the present time we are really obliged to look in this direction for a solution of the question. The known facts in regard to sex indicate that we have to deal with two sharply contrasted, yet interchangeable states. Furthermore, the facts seem to indicate that some internal mechanism exists that gives with great precision the one or the other condition. We lack completely at present the necessary knowledge of the chemistry of the cell on which alone we can hope to establish a real theory of sex determination. It might be possible indeed to invent a purely fictitious, *quasi* chemical, hypothesis, such, for instance, as assuming that the female and the male represent two contrasted conditions of the same protoplasm, one state being a combined (the female) and the other a separated (male) condition of the aggregate bodies (molecules) of which the protoplasm is composed. While we might, were it worth while, work out this or some similar idea into a more or less consistent hypothesis, the only value that such a conception might have at present would be to indicate that sex determination may not be the result of differential *nuclear* divisions that locate sex determining chromosomes in different cells, but that the process is chemical rather than morphological.

T. H. MORGAN.

COLUMBIA UNIVERSITY.

THE SARGASSO FISH NOT A NEST-MAKER.

EVER since 1872 the sargasso fish (*Pterophryne histrio*) has been famous as the builder of a remarkable globular nest made of the sargasso weed, in the midst of which it finds a congenial home. Professor Louis Agassiz first described such nests observed by him in December, 1871, during a voyage to Brazil and attributed them to the Antennariid. No one has since doubted the accuracy of the identification, and in innumerable works it has been accepted as well established. A few weeks ago, however, Dr. Hugh Smith, deputy fish commissioner, informed me that he had obtained eggs laid by the sargasso fish and, on a visit to his office, he showed me some under a microscope, and I was surprised to find that they were quite different from those found in connection with the nests and which had been elaborately described by Vaillant and Möbius. Later I received a letter from Professor E. W. Gudger, of the State Normal College of North Carolina, containing an account of the pterophryne's oviposition. This corresponds remarkably with that practised by the fish's distant relative, the angler (*Lophius piscatorius*). The elaborate provision thus made specially for the eggs, as well as the absence of polar filaments, negatives the attribution of such eggs to the nest-maker of the sargasso sea and leaves the question of the real maker an unsolved problem. Similar eggs were found free on the surface of the sea off the African coast and noticed by Cunningham (1887) but not identified. Can such be the product of a flying-fish?

The fish, whatever it may be, is probably not a direct maker of the nest but the filaments of the eggs may, perhaps, become mechanically entangled with the fronds as well as with each other and the contraction into a subglobular mass may be the result.

Professor Gudger's communication is herewith submitted.

THEO. GILL.

A NOTE ON THE EGGS AND EGG-LAYING OF PTEROPHRYNE HISTRIO, THE GULFWEED FISH.

SPECIMENS of the gulfweed fish occasionally drift with the *Sargassum* into the harbor of Beaufort, N. C., and are picked up along the beach by boys and brought to the laboratory of the United States Bureau of Fisheries.

When I reached the laboratory about the middle of June, 1905, there were two of these interesting fishes confined in an aquarium of running salt water. These were put in my care and on one of them and its eggs the following observations were made. The two fishes were of unequal size and were contin-

ually fighting. In these daily combats, the smaller suffered considerably, its filamentous appendages and even the ends of its fins being bitten off. Finally it was killed and preserved as a museum specimen. Its sex was not determined.

The larger fish, thus left alone, did not seem to miss its companion. It fed voraciously, eating pieces of oyster, bits of shrimp and small fishes alive or dead. In catching its prey it would with closed mouth draw near, and then opening it suddenly (the premaxillaries and lower jaw protruding considerably), would take in its prey with an instantaneous gulp. Frequently, however, *Pterophryne* would remain perfectly quiet amid the *Sargassum*, holding on to the branches with its hand-like pectorals and waiting for the little fishes to come near it. It grew very fat with high feeding and its abdomen became much enlarged, in front of the anus becoming as square as if it had been cut to shape with a knife. Nothing, however, was thought of this save that the fish was getting very fat.

About noon, on July 25 (after the fish had been in captivity seven weeks), the writer passed through that part of the laboratory where the aquaria were, and found that the Sargassum-fish had laid a large quantity of eggs which, imbedded in jelly, floated at the surface of the water. The eggs, whose number there were no means of computing, together with the enveloping jelly, formed a long string which would have more than filled a pint cup (250 c.c.). This jelly had evidently swollen on contact with the water, for the fish, which was only three or three and one half inches long, had only about one third of the volume of the eggs and jelly combined. After the extrusion of the eggs, the size of the fish was noticeably decreased, and the 'fatness' largely disappeared.

The eggs were examined alive and, later, sections were made of them. The germinal disk begins to form shortly after the eggs are laid and this fact is noteworthy, in that, according to Agassiz and Whitman, in pelagic fish eggs this is generally not formed until after fertilization. The formation of the germinal disk, however, proceeds unequally rapidly, and, at the end of four and one half hours (at which time the eggs now in my possession were killed), had in no egg examined made such a round, clearly marked off, button-shaped disk as all workers have found in the egg of the salmonoids, and as I have figured for the pipefish, *Siphostoma floridæ*. On the contrary, observations on the living egg, confirmed by the study of sections, show that the germinal disk is partly sunken in a depression in the yolk, half of its thickness being below the general level of the yolk. The germinal disk in the eggs of the Salmonidæ is sunken in a depression, in the center of which it forms a mound, touching the yolk only at its base. In *Pterophryne*, however, the protoplasm entirely fills the depression in the yolk (this in eggs four and one half hours old), a phenomenon, so far as I know, not before reported for any teleostean egg.

The protoplasm first exists as a shell of uniform thickness surrounding the yolk, and in the living egg, shortly after it begins to thicken at one pole to form the germinal disk, there may be seen in optical section a clearly defined nucleus. On the contrary, however, I have never been able, either in sections or in the living egg of the pipefish, to find a nucleus in the one-celled stage. Unlike most pelagic eggs, there are no oil drops visible in the *living* egg of *Pterophryne*. In sections, some eggs show a small number of minute vacuoles indiscriminately scattered under the germ disk and around the circumference of the yolk; some are devoid of these, and two eggs had two large ones each. These vacuoles were in life presumably filled with oil drops, which have been dissolved out by the alcohol. In the living eggs, no oil drops were ever seen and until the sections had been examined the writer was confident none existed. Indeed, they would seem to be a negligible quantity. The function of the jelly then evidently is to serve as a float to keep the eggs at the surface of the water.

The yolk is colorless and without texture, and, being perfectly homogeneous, is so translucent as to approach transparency. The egg, which is surrounded by a thin, smooth, transparent shell, is as easily separated from

the jelly as that of the frog. The eggs vary in size, but on the average are about 1 mm. in diameter.

The fish continued to thrive, although feeding perhaps less ravenously, and was in perfect condition some five weeks later when I left the laboratory. About half the eggs were preserved in formalin, and, excepting the few kept by the writer, were deposited in the museum of the laboratory at Beaufort.

These observations were made at the laboratory of the United States Bureau of Fisheries of Beaufort, N. C. For permission to make use of the excellent facilities there, I am indebted to the Commissioner, Hon. George M. Bowers.

E. W. GUDGER.

STATE NORMAL COLLEGE,
GREENSBORO, N. C.,
October 7, 1905.

SEX DIFFERENCES IN THE ESTIMATION OF TIME.

IN volume 19, pages 707–708, of this journal Professor Robert MacDougall published an account of some experiments on the 'time sense' of men and women which seemed to indicate certain important sex differences. As he states, however, 'the noting of these sex differences was incidental to the primary purpose of the test, and attention is called to them here in order that observations on the part of others may be brought into comparison with the results presented by this group of persons.'

Since MacDougall's results were obtained by the examination of only fifteen persons of each sex, further investigation of the subject is evidently important. We have, therefore, carried out experiments along similar lines with hundreds of subjects for the purpose of ascertaining the significance of sex, age and physiological rhythms in the estimation of time. In the present report we shall consider only the relation of sex to time judgments.[1]

The subjects were required to judge the length of each of four intervals, 18, 36, 72 and 108 seconds, under four different conditions, which are designated in the table as idleness, estimating, reading and writing. During the *idleness* intervals the subject waited passively for the elapsing of the time; during *estimating* he made use of the method of his own selection by which he could best judge of the length of the period; during *reading* he listened while the experimenter read, and during *writing* he wrote from the dictation of the experimenter.

For comparison of the sexes groups of 251 males, from seventeen to twenty-three years old, and 274 females, from seventeen to twenty years old, were examined. In the accompanying table we present the means, mean variabilities and relative variabilities of each sex group for each interval and filling.

Intervals.	Fillings.	Mean.		Mean Variability.		Relative Variability.	
		M.	F	M.	F.	M.	F.
18″	I	17.7″	20.7″	5.4″	10.4″	30	50
	E	19.5	25.6	4.9	9.8	25	39
	R	15.5	18.5	4.9	9.1	31	49
	W	11.5	15.6	3.7	8.6	33	55
36″	I	33.3	42.8	9.1	16.6	27	38
	E	33.1	41.5	8.4	15.2	25	37
	R	32.1	41.7	8.4	16.4	26	39
	W	24.7	30.1	9.0	14.7	36	49
72″	I	63.3	73.0	17.2	27.2	27	37
	E	63.1	77.1	16.0	26.6	27	34
	R	57.9	70.8	17.3	30.3	30	43
	W	51.2	54.9	19.8	24.2	37	44
108″	I	92.7	113.4	29.8	40.1	32	35
	E	99.8	114.9	26.3	36.4	26	32
	R	90.1	100.5	28.3	40.2	31	40
	W	75.5	87.5	32.4	45.3	42	52

Summarily stated our investigation indicates the following sex differences:

1. The females were much less accurate than males in the estimation of the intervals under consideration. The range of the male judgments was from 1 to 300 seconds, that of the female from 1 to 400 seconds.

2. The females greatly overestimate the intervals in most cases, whereas the males almost invariably underestimate them. The length of the second itself is usually much shorter in the judgment of the female than in that of the male.

[1] A detailed account of the investigation is in process of publication in volume 2 of the *Harvard Psychological Studies*.

Our results agree entirely with those of MacDougall. Discussion of their significance may well be postponed until the completion of an investigation, now in progress, of the relations of age and physiological rhythms to time estimation.

Robert M. Yerkes,
F. M. Urban.

Harvard University.

PRELIMINARY ANNOUNCEMENT CONCERNING A NEW MERCURY MINERAL FROM TERLINGUA, TEXAS.

The mercury minerals of the Terlingua district, Texas, are noted for the unusual composition of several of their number. Besides cinnabar, calomel and mercuric oxide, two oxychlorides, eglestonite and terlinguaite, have been described in detail by Professor A. J. Moses (A. J. S. **166**, 253, 1903), and a third, as yet unnamed, has been provisionally identified by him as likewise an oxychloride. This last, the No. 5 of Professor Moses, seems to be the chief mineral in a number of specimens from the Terlingua District lately received for identification from Mr. H. W. Turner. Its examination reveals a composition most singular and apparently representative of a class of compounds hitherto unknown in nature, viz.: mercur-ammonium salts. So far as yet known, the qualitative composition is represented by the components Hg, N, Cl, SO_4, probably O and possibly H. The tests, both qualitative and quantitative, thus far made, seem to show with little room for doubt that the mercury and nitrogen form the mercur-ammonium radical. Dr. P. G. Nutting, of the Bureau of Standards, has kindly examined spectroscopically the products of progressive heating of the mineral under reduced pressure; and besides nitrogen, mercury, chlorine and sulphur, obtained a small amount of helium. Singularly enough, this last seemed to come off wholly during the first warming of the mineral and before it underwent any visible breaking-up.

The complete examination of this novel mineral and its associated mercury compounds will probably consume much time. In order to reserve the field for the chemical examination by myself and the crystallographical (now in progress) by Mr. W. T. Schaller, this preliminary announcement is made.

W. F. Hillebrand.

U. S. Geological Survey,
Washington, D. C.,
December 14, 1905.

QUOTATIONS.

UNIVERSITY ADMINISTRATION.

In the December *Popular Science Monthly* Professor John J. Stevenson again takes up the question of the status of American college professors, maintaining that the present tendency to subordinate them to the trustees and to the president is contrary to the real interests of educational progress. The trustees are successful men of business or professional life for the most part, with neither the time nor the expert knowledge necessary to administer wisely the internal affairs of an institution of learning. The president, once a good professor as well, must now be a successful business manager and money-getter, teaching little if at all, and, like the trustees, possessing neither the time nor the knowledge requisite to the sagacious exercise of the powers which are generally either sought by him or thrust into his hands under existing conditions. The trustees, then, should confine themselves strictly to the management of the property and the task of securing funds for the carrying out of such educational policies as the teaching force may advise. Even in filling vacancies in their own number, their action, he is inclined to think, should be subject to veto by two thirds of the full professors. Vacancies in the faculty should be filled by the faculty itself, subject to confirmation of the trustees merely *pro forma*, or to rejection in case there are not funds available for the required salary. The presidency should be abolished altogether, each faculty selecting its own executive head, who should be simply *primus inter pares*, and the mouthpiece of the faculty in its relations with the trustees. It is noticeable that the editor of the *Monthly*, in a paragraph relating to the recent conference of college and university trustees held at the installation of the presi-

dent of the University of Illinois, questions the theory that the recent rapid growth in the material endowment of colleges is the work of the presidency, and also suggests that, even if it were, institutions are not always such centers of education, scholarship and research as their liberal endowments would lead one to suppose. It is only the great teacher and investigator, after all, who can impart anything but mere material greatness to an institution of learning.—*The Nation.*

A COLLEGE was originally a society of scholars organized for the pursuit and acquirement of knowledge. It sent forth its alumni to be ministers, jurists, physicians, teachers—leaders in their communities. It was for this purpose that colleges were founded in our country. They stood for the highest ideals of manhood. They and their graduates created and represented those ideals for which the college was responsible.

The president was then the head of the college. To the community he stood for what the college was and was doing for it. The people saw in him the disciplined mind and the all-around manhood which they honored and to which they taught their sons to aspire. To the faculty he was the leader in their plans, and the inspirer of their aims. Students went to the college already reverencing him as the embodiment of a high ideal, went to him when there as counsellor and friend, passed under his instruction in the upper classes and carried the impress of his character through their lives. Such men as Mark Hopkins, of Williams, and Theodore Woolsey, of Yale, and James Fairchild, of Oberlin, reproduced their noblest qualities directly and indirectly in thousands of leaders of men, and no men in any office in this country have surpassed them in its service.

The average college president of to-day represents no such ideal. He is not sought for it, has no opportunity to realize it. There are men of the type here described, but they are exceptions. The college president is chosen because of his ability as a money getter. His business is to beg from rich men and from women who have fortunes left to them. His success is measured by the number and cost of the buildings erected with the money he has raised and by the amount of endowment he has secured. There are college presidents whose faces are more familiar to business men in Boston and New York than to their own students, who have earned no more right to a place in the ranks of scholars than the captains of their college football teams, and who are less honored and heroic than they are in the public's esteem.

None feels the degradation of the high office of the college president as keenly as he does. In many cases he has accepted his office with a worthier purpose than that which he has been forced to adopt. He has yielded most reluctantly to the compulsion to join the already overfull procession of those who were nominally chosen as intellectual and moral leaders of men, who crowd on one another in the anterooms of business offices and in ringing the doorbells of the rich.—*The Congregationalist.*

A NEW SCHOOL FOR CLAY WORKERS.

THE University of Illinois has issued a bulletin describing the courses in ceramics which it now offers for the first time. The rapid destruction of our forests and the consequent increase in value of all kinds of lumber are causing people to look with new interest toward clay products as the most promising building and decorative materials of the near future, and this interest has caused a demand for cheaper and better materials of this class.

Clay workers are beginning to realize that in order to meet this demand they must put men who are well educated along lines of applied science and mechanics in control of their plants and are inquiring where such men can be found. As there are but three schools in this country which offer instruction especially planned to meet the needs of clay workers, the demand far exceeds the supply and manufacturers are willing to pay well for the services of competent men, hence the University of Illinois feels justified in adding such instruction to the technical courses which it has offered heretofore.

Two courses are offered, both of which

recognize the fact that no good work can be done in ceramics which is not based on the three sciences, chemistry, physics and geology. With these sciences and technical instruction in clay working as its backbone, the course in ceramics also offers instruction in art, English and modern languages, mathematics, physical training and military tactics.

In the course in ceramic engineering, instruction in art and in certain technical subjects is replaced by elementary courses in electrical, mechanical and civil engineering. The course is intended principally for those who wish to install plants rather than operate them. Substitutions are also suggested which will adapt the course to the needs of the manufacturer of limes and cements.

Students in all except the strictly technical subjects work in the laboratories of the scientific and engineering departments. The special ceramic laboratories are equipped with kilns, furnaces, presses, mills, jiggers, whirlers, and such other machines, all of the latest and most approved types, as are necessary to enable the student to do thoroughly practical work.

The school counts among its friends the managers of nearly all the large clay-working establishments in Illinois, and there seems to be no reason why it shall not speedily become very helpful to the clay interests of the state and nation and at the same time open to young men a new and profitable field for effort.

PHYSIOLOGY AND EXPERIMENTAL MEDICINE AT THE NEW ORLEANS MEETING.

The sessions of Section K of the American Association for the Advancement of Science, which will be held on the morning and afternoon of January 1, promise to be of unusual interest. The morning session will be opened by an address by the vice-president, Dr. William T. Sedgwick, on 'The Experimental Method in Sanitary Science and Sanitary Practise.' The remainder of the morning session and all of the afternoon will be devoted to a symposium on yellow fever and other insect-borne diseases. Yellow fever in its various phases will be discussed by Drs. J. H. White, Quitman Kohnke, James Carroll and H. A. Veazie. It is expected that Dr. Edmund Souchon, Surgeon-General Wyman and Col. W. C. Gorgas and other specialists, will also take part in the discussion. Dr. William S. Thayer will read a paper on 'The Problem of Prophylaxis Against Malaria in the United States,' Dr. Henry B. Ward will consider filariasis and trypanosome diseases, Dr. Charles W. Stiles will present a résumé of facts bearing on the principles involved in the transmission of diseases by insects, and Dr. Gary N. Calkins will discuss the protozoon life cycle. Dr. L. O. Howard will talk on mosquitoes that carry disease and Mr. Henry Clay Weeks, secretary of the American Mosquito Extermination Society, will present the practical side of mosquito extermination.

William J. Gies,
Secretary.

SCIENTIFIC NOTES AND NEWS.

Dr. Henry S. Pritchett has resigned the presidency of the Massachusetts Institute of Technology to accept the presidency of the Carnegie Foundation for pensioning college and university professors, the offices of which will be in New York City.

A department of botanical research to include the Desert Laboratory and other botanical projects, was established by the action of the trustees of the Carnegie Institution at a recent meeting. Dr. D. T. MacDougal has resigned as assistant director of the New York Botanical Garden to accept the post of director of the newly organized department.

Major D. Prain, hitherto director of the Botanical Garden at Calcutta, has been appointed to the directorship of Kew Gardens, vacant by the retirement of Sir William Thiselton-Dyer.

Mr. F. W. Dyson, F.R.S., chief assistant at Greenwich Observatory, has been appointed astronomer royal for Scotland, and professor of practical astronomy in Edinburgh University, in the room of the late Professor Copeland.

Professor William Stirling, M.D., Brackenbury professor of physiology and histology

in the Victoria University, Manchester, has been elected Fullerian professor of physiology to the Royal Institution, London.

DR. WILLIAM OSLER, regius professor of medicine at Oxford, is a passenger on the *Caronia*, which is due in New York at the end of this week.

The Botanical Gazette states that Professors Macbride and Shimek, of the University of Iowa, spent part of last summer in the southwestern deserts, especially in the Salton basin. The university herbarium now contains a fairly complete representation of the flora of New Mexico and Arizona.

DR. W. WIRTINGER, professor of mathematics at Vienna, has been elected a member of the Vienna Academy of Sciences.

THE Royal Society of Arts has awarded a silver medal to the Hon. Robert P. Porter, former head of the U. S. Census Office, for his paper read before the society, on 'London Electric Railways.'

The British Medical Journal states that Professor Czerny has resigned the chair of surgery in the University of Heidelberg, which he has held since 1877, in order to devote himself entirely to the duties of director of the Institute of Cancer Research. He will be succeeded in the chair of surgery by Professor Garré, who accepted a call to Breslau after the death of Professor von Mikulicz.

DR. A. B. MEYER has been dismissed from the directorship of the Zoological and Ethnographical Museum at Dresden for alleged irregularities in the conduct of the museum.

ON December 29 Dr. Thomas Darlington, health commissioner of New York, will deliver a public lecture at the Academy of Medicine on the results of the work of the two commissions appointed last spring to study pneumonia and cerebrospinal meningitis.

THE committee appointed to carry the proposal of a memorial to Rudolf Virchow into effect has now a sum of $20,000 at its disposal. Of this amount $9,000 has been contributed by subscribers and $11,000 by the city of Berlin. Three prizes, of the value respectively of $750, $500 and $250, are offered for the best design of a memorial. Drawings must be sent in before April, 1906.

DR. WALTER WISLICENUS, associate professor of astronomy at Strassburg, died on October 3, at the age of forty-six years.

THE death is announced of Professor von Leuthold, surgeon-general of the German army.

DR. ERNST ZIEGLER, professor of pathology in the University of Freiburg, died on November 30, in his fifty-seventh year.

IN connection with the approaching meeting of the American Association the New England Passenger Association offers a rate of a fare and a third to Washington or other trunk line southern or western termini, added to one fare plus twenty-five cents for the round trip (this does not include the Eastern Steamship Company).

THE fourth annual meeting of the American Paleontological Society (Vertebrates) will be held at the American Museum of Natural History, New York, on Wednesday and Thursday, December 27 and 28. This is the second regular meeting, and will be presided over by Professor William B. Scott of Princeton University, Dr. Marcus S. Farr, of the same institution, acting as secretary. Professor Scott's presidential address will be upon the geology and paleontology of South Africa, so far as observed during his recent visit in connection with the British Association for the Advancement of Science.

A MEETING of those members of the Division of Hydrology of the United States Geological Survey who are engaged in artesian water and related geologic investigations was held in Washington on December 9, for the purpose of organizing a society for the discussion of problems relating to underground waters and methods of increasing the efficiency and economic value of investigations. Among those attending the meeting were F. H. Newell, chief engineer of the Geological Survey, and officials and members of the division of hydrology. The formation of the new society was decided upon, but the details of organzation were left to a future meeting.

THE anniversary meeting of the Royal Society was held on November 30, with Sir William Huggins in the chair. After the report of the council had been presented and the president had delivered an address, Lord Rayleigh was elected president of the society, and presided at the dinner in the evening. In answer to the toast of 'The Medallists,' Professor Mendelièff, Professor Righi, Professor Poynting and Professor Sherrington replied.

THE International Congress of Prehistoric Anthropology and Archeology will hold its thirteenth meeting at Monaco, under the patronage of Prince Albert the First, from April 16 to 21, 1906. Detailed information as to the congress may be obtained on application to the general secretary, Dr. Verneau, 61, Rue de Buffon, Paris.

THE new building of the Rockefeller Institute at the foot of East 56th St., New York City, will be ready for occupancy in January.

Nature, quoting from the *Chemiker-Zeitung*, states that the German state grant for the support of scientific, technical and similar undertakings is to be increased by 115,000 Marks. The sum of 179,500 Marks is to be spent upon increasing the accommodation for the permanent exhibition devoted to the interests of the working classes; 120,000 Marks to be a first instalment for investigation of sleeping sickness; 30,000 Marks to be devoted to the development of the Starkstrom laboratory of the Reichsanstalt; 43,850 Marks to be contributed to the kite station on Lake Constance for experimental investigations of the higher air strata.

WE learn from *The British Medical Journal* that Professor Debove recently presented to the Académie de Médecine, Paris, the report for 1904 of the Scientific Information Bureau. During the year 8,000 persons applied for information as to courses of instruction, laboratories, hospitals, libraries and archives. Fifty-five per cent. of the applicants were foreigners, the countries represented being Great Britain, the United States, Russia, Scandinavia, Italy, Spain, South America, Germany, Japan and China. Sometimes there were from seventy to eighty applicants in one day. The staff of the bureau consists of four persons, and answers to questions can be given in five languages. The members of the bureau are paid by the Municipal Council and the Council of the University. It may be mentioned that the information supplied is by no means confined to matters relating to medicine; replies are given to inquiries as to the French language and literature, the fine arts, industrial physics and chemistry, etc.

UNIVERSITY AND EDUCATIONAL NEWS.

MRS. HELEN C. COBURN has by her will made public bequests mounting to $450,000. $10,000 are given to Radcliffe College, $40,000 to Phillips-Andover Academy, $75,000 to the Massachusetts General Hospital, and considerable sums to institutions for the education of negroes.

MR. ANDREW CARNEGIE has agreed to give $100,000 to equip the electrical engineering laboratory of Union College, provided the college raises $100,000 to endow it.

YALE UNIVERSITY has received from two anonymous donors a gift of $75,000, which, subject to certain annuities, will be used to found a lectureship on 'The interrelation of religion, science and philosophy.'

OBERLIN COLLEGE receives $10,000 by the will of the late Miss Annie Walworth, Cleveland.

MR. JOHN WILLIAM TAYLOR, of Kensington, has bequeathed $100,000 to Owen's College, Manchester, now a part of Victoria University.

PROFESSOR CRUM BROWN has given to the University of Edinburgh a collection of over 2,000 specimens of chemical substances.

THE Japanese minister of education having caused the resignation of one of the professors of the University of Tokyo, owing to his attitude on public questions, the professors of the university have signed a protest, which has led to the resignation of the minister of education and the assumption of his portfolio by the premier. It is said that the position of the cabinet has been greatly weakened by this action of the minister of education.

PROFESSOR C. H. JUDD, of Yale University, has been appointed director of the summer school.